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On Trial

WHEN DISTRICT AFTER DISTRICT in the bituminous coal fields parted company with organized labor a few years ago, they embarked upon an experiment in internal regulation without precedent for success in the history of the industry. Today the results of that experiment are finding expression in widespread labor disturbances.

NO OPERATOR needs to be told the causes which underlie the reappearance of industrial strife in Kentucky, Pennsylvania, Ohio, and West Virginia. Their inevitability was foretold when a major part of an overdeveloped and disorganized industry exchanged the restrictions of contractual labor relations for unlicensed indulgence in ruinous wage and price competition.

THAT THE MAJOR UPHEAVALS have been engineered by an organization alien to our national philosophy is more significant than palliative. Communism feeds upon desperation; the fact that the National Miners' Union has been able to make such headway should be provocative of deep thinking by those who really believe in American concepts of a partnership between capital and labor.

IF LEADERSHIP in bituminous coal—both management and labor—is to make such an approach to this major problem of industrial relations, passion and prejudice must be barred from the deliberations. Politics, too, has no place. Traditional attitudes must give way to frank acceptance of realities and unreserved consideration of how these realities best may be met.

ALLIANCE with the National Miners' Union is unthinkable because the ultimate aim of that organization is the destruction of our present capitalistic civilization. District unions without national affiliations are handicapped by the same limitations as company unions; the difference in limitations is only one of degree.

ELIMINATION of these organizations from consideration naturally raises the question whether reestablishment of the United Mine Workers, or some other national union, to the position of dominance held by the Indianapolis group prior to 1920 is the only way out. Such a suggestion is anathema to many operators who have never recognized the union and to many others who suffered under its control.

THE QUESTION, nevertheless, is there. It must be answered either by a demonstration of a yet unrevealed ability on the part of the employers to preserve decent industrial relations without union help or by a demonstration on the part of organized labor that it is now ready to play the economic rôle it once sacrificed to internal politics. Any other answer is illusory—or worse.

FOURTH OF A SERIES OF ARTICLES ON THE FUNDAMENTALS OF MODERN COAL PREPARATION

ELECTRIFICATION PROBLEMS + In Modern Preparation Plants—I

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BEFORE discussing the electrification of modern coal preparation plants such as use washing processes, one should not fail to consider the fact that progress, before many years elapse, may make not a few of our present ideas obsolete. Certain fundamental principles, however, should be adopted in outlining the electrification program, and when they are followed the final result is not likely to be embarrassing, at least not until some years after construction is completed.

Past methods of electrification and past types of equipment should first be studied, not with the idea of slavishly following old practices but rather with the view to adopting all that is good in them, and to avoid in the new plant characteristics and units which in former plants have been proved unsatisfactory. Wholesale disregard of present practice has in many instances proved disastrous and extravagant. Still more important, perhaps, it is to remember that when efforts are made to revolutionize everything at a single stroke the changes may be so ill-judged that they will actually retard rather than aid progress.

Usually the company which undertakes the design and construction of a modern preparation plant is one which is already operating mines and tipples, but even if it be a new company its methods of applying electricity will perforce be dictated in part by past methods of the industry. It is important to remember that the employment of unusual types of equipment in places where such equipment is not necessary places a needless burden of cost on the plant, not only during installation but thereafter, because the company, due to the unusual character of the parts involved, will have always to keep additional repair parts in stock.

Simplicity and economy, therefore, should guide the designer in his selection of electrical equipment. In even the most modern plant, units which now represent the best practice will, of necessity, have to be replaced by others later, and special electrical equipment originally adapted to these units, if not of somewhat general applicability, probably will become at least a partial loss as soon as the change is made and, if it be not changed, its retention in any event will be likely to result in losses.

Economy must always be in the mind of the electrical engineer; he must do his utmost to get the most out of every dollar he spends. This does not necessarily mean that the equipment should be cheap or the methods of installing electrical units be niggardly. In more places than one can be seen instances where sections of plants must eventually be reconstructed at great cost because excessive economy was used in the primary installation. Much would have been saved if the plant and its equipment had been better designed and erected in the first instance.

But, though it be true that parsimony is a fault rather than a virtue, so also is it true that, in the selection of accessories, care must be taken to avoid so elaborate and costly a design as will deter the company from attempting to build a plant of modern type. That would be unfortunate indeed, for many of the up-to-date types of machines have been given adequate trial and have abundantly proved their value.

A new element in design, however, is beginning to make itself felt. In future large investments in preparation plants may be made without fear of loss, because they will be operated more hours than 8 out of 24. Conversely, because the costs of preparation by all modern methods are necessarily large it may be found that 8 hours is far too short a time in a day to effect an earning sufficient to pay interest and amortization charges. In a few years preparation plants may be working on a schedule of two night shifts only, or may be operated continuously.

Because of the rapid forward steps being made in the details of coal preparation the utmost flexibility must be provided in the electrical system. New machinery bought for trial should be equipped with types of electrical drives and controls that can be salvaged at full value if the new machine does not prove to be a beneficial adjunct of the process.

Throughout the designing of the plant, the layout, selection, and installation of the electrical equipment must be borne in mind. In the past the electrical details have been fitted into the plant in the best manner possible after all the other details have been fixed. This sometimes necessitates improper and unsuitable selection and installation of the electric equipment. Because of the flexibility of electric wire and conduits, this disadvantage may not be obvious, but nevertheless it is always present whenever the solution of electrical problems has been treated as an afterthought.

Nor is the electrical part of the installation to be regarded as of secondary importance. Some of the

most far-reaching changes in plant operation have resulted from broadening the application of electrical equipment. Electrification has now grown to the point where the power bill of a coal company is one of its large cash expenditures. In consequence, a small percentage of reduction in the power costs represents a large saving in dollars.

Surprising as it may sound, where power is purchased the schedule under which payments for energy are made may determine how the plant should be built. For example, sometimes by operating a plant at night, power can be purchased at a considerable reduction, and if then, also, it can be operated at half load in the daytime without disturbing the savings due to night operation, it would be highly economical to build the plant in twin parts, running both parts at night and only one part during the day. In some instances such an arrangement would save a maximum of power cost and at the same time give the plant equipment a high operating load factor, all of which is one of the few ways remaining whereby the coal industry can effect a large saving.

Electrical layouts and plans for new plants must, therefore, be made with a clear visualization of the future demands of the industry. Only recently have capital investments for electrical equipment, power bills, and electrical delays become matters of primary interest. Today, in some instances they decide how many hours the plant should operate and, furthermore, which hours of each day should be chosen for the running period.

To facilitate operation, maintenance, new construction, etc., every effort should be made to keep the yard of the preparation plant free from overhead wires, poles, and brackets. To this end the conductors leading to and around the plant should be placed underground or run along galleries, walkways, etc.

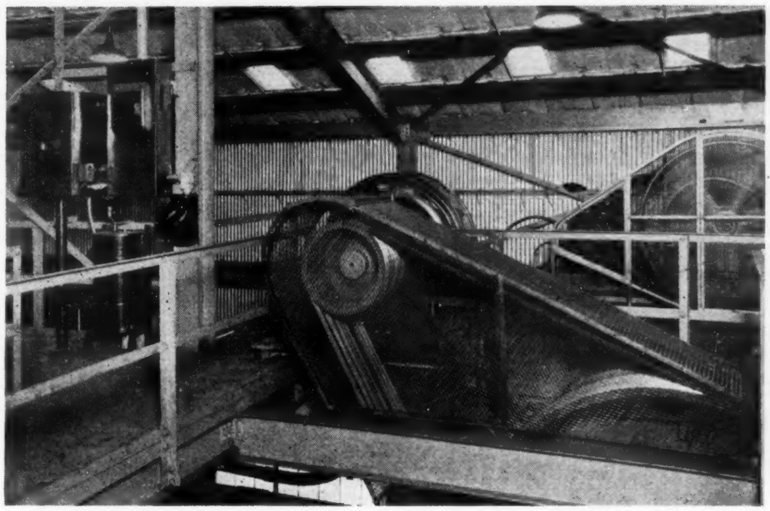


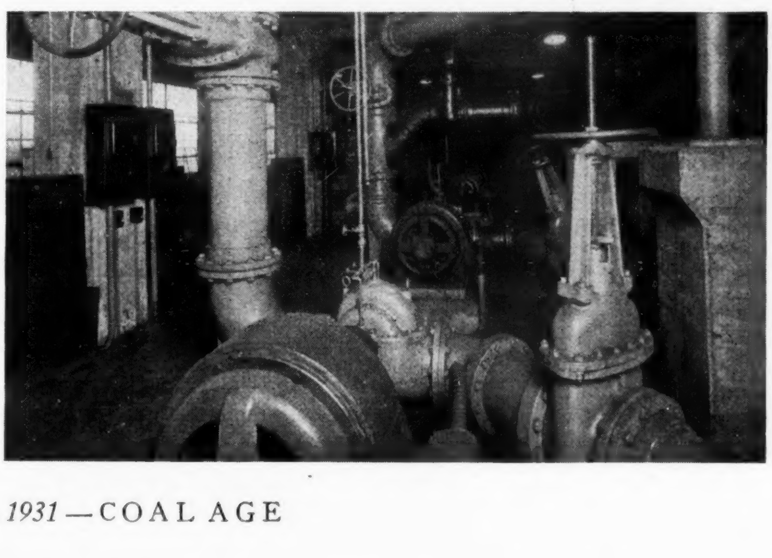
Fig. 2—Example of the Use of Standard Equipment

Frequently conveyor passageways can be used for the conductors, but where this is not possible, trenches may be dug and the cables supported on brackets or insulators in special inclosures. Wherever heavy traffic, such as railroad cars, mine cars, or wagons, must pass over electric circuits, the cables should be carried in a strongly reinforced passageway, or, probably better yet, in an iron conduit laid in a trench and adequately protected by concrete.

The electric load curve and other power characteristics in Rhéolaveur plants, of various sizes, complete with Carpenter dryers, kiln-type heat dryers, sludge recovering units, experimental equipment, etc., as operated by the Pittsburgh Coal Co. reveal the following data:

The load curve during operating hours is quite flat; it is even such that in almost any month the three highest fifteen-minute maximum demands, obtained from a graphic wattmeter, rarely vary more than 3 per cent. The load factor of the plants, based on the monthly fifteen-minute demands and kilowatt-hour energy consumption, is between 40 and 50 per cent during the whole year. The maximum demand of these plants is approximately 200 kw. per 100 tons of plant capacity. The kilowatt-hours per ton of coal passed through the plant is between 1.5 and 1.9 throughout the year. All of these figures are influenced, of course, by the number of operating hours, or, in other words, by the market for coal.

Fig. 1—Control and Pushbuttons Are Located Near the Equipment Which They Regulate



For metering and control purposes the component parts of the plant should be operated from different circuits. The plant naturally divides itself into the following divisions: (1) pumping, (2) mechanical drying and sludge recovery, (3) washing, (4) loading and mixing clean coal, (5) dumping of raw coal, (6) tipple operation, (7) heat drying, (8) screening and sizing, and (9) miscellaneous.

Economy would seem at first to dictate that the meters, switches, and controls for these several subdivisions should be set up inside the plant or closely attached to it, but this location in several instances has proved disadvantageous, because of vibration, moisture, dust, fire risk, accident hazard, increased insurance ratings, and the necessity for plant changes.

In future, the dangers of oil circuit breakers may not have to be faced, for there is a definite trend toward air-break overload circuit breakers. With these, some of the disadvantages of a substation within the structure are overcome; nevertheless, best practice dictates that the substation be located at a point remote from the main plant, because of the considerations already mentioned.

If air-break feeder switches are used, transformers will be the only oil-containing electrical devices needed about the plant, and as the number of these is limited, and as they may be readily installed out of doors, they cease to be any real hazard; thus the danger of a fire from the ignition of oil used with electrical equipment is almost entirely eliminated.

Separate metering of the main branch circuits has proved a valuable aid to economy. This metering should consist of a permanent watt-hour meter with a maximum-demand indicator together with proper meter plugs or switches for graphically determining the phase currents and kilowatt load by means of portable instruments. The purpose is to eliminate the cost of separate indicating meters for each of the feeders and to provide sufficient graphic instruments to be used on the circuits when periodical tests are made.

However, the main incoming panel should be equipped with an indicating ammeter and the following graphic instruments: wattmeter, voltmeter, reactive kva. meter, and a watt-hour meter with a maximum demand attachment. A reactive kva. meter is much more desirable than a power-factor meter, because it not only provides power-factor information but gives a direct indication of the reactive component of the load.

In modern plants the trend is to put on the switchboard fewer of the unneeded indicating type meters and of the less frequently used devices, and instead provide means for positively protecting the circuits and easily checking the load and tripping mechanism, so as to be sure at all times that the power requirements are known and that the devices for protection will not fail of their purpose.

Standards for the voltage of preparation-plant equipment have become more or less fixed. Because the motors of the largest preparation plants usually have not exceeded 100 hp., it has been found that 440-volt, three-phase, 60-cycle current, which is highly desirable for motors of 1 hp. upward, fills all requirements.

Because of the favorable starting conditions obtained from three-phase 440-volt motors, they are to be preferred to single-phase motors even where these are of small size. However, where the motors are of less capacity than 1 hp., slight moisture sometimes present makes 220- or 110-volt motors preferable, especially the latter. The 440-volt, three-phase motor in sizes smaller than 1 hp. is difficult to insulate adequately and may be grounded or short-circuited.

For certain conditions of service the greater flexibility attained by the use of metal wiring trough is of great value. This is particularly true wherever rigid iron conduit would render difficult the addition of wires in a given section, or the tapping of the circuits at a later date.

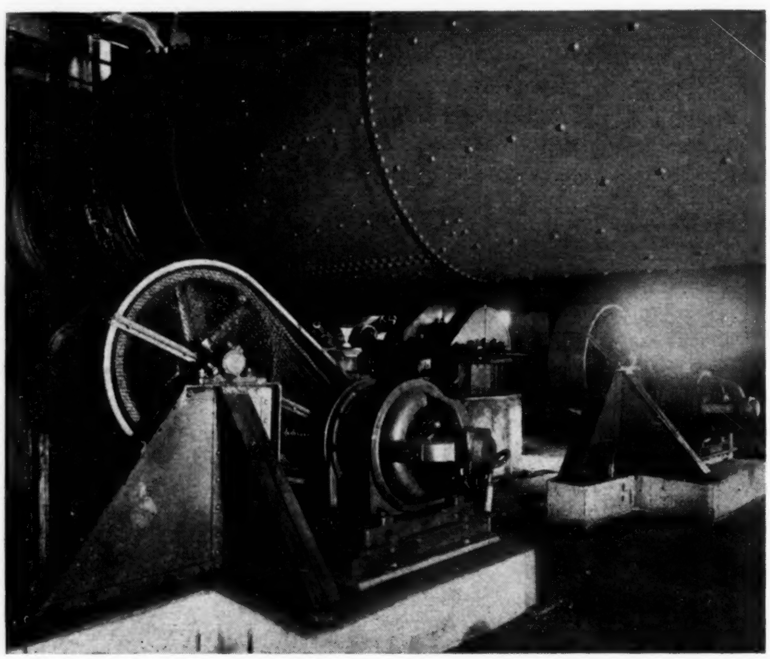
Junction boxes should be provided in various locations on conduit runs, as it is much easier to extend and run out branches from such boxes than to break into the rigid conduit for this purpose. Such boxes also obviate the need for pulling long sections of wire around bends and fittings and enable the workman to make more satisfactory connections to the wiring.

For locations where changes, additions, and improvements are to be made in the electric equipment, metal wiring troughs and fittings are rapidly becoming available. With them many circuits can be installed in a single trough system, whereas with rigid conduit several runs would be necessary. Another advantage of metal wiring troughs is that moisture in the system can be readily drained.

Where iron conduits pass through concrete floors or bins and where, therefore, water may come in contact with the pipes, they should be given a coating of tar or asphaltum. For the smaller size single-circuit lines close to motors or controls the use of threadless conduit fitting is good practice.

At right-angled turns in the conduit systems where fittings are used, it is frequently advisable to use a T rather than an L. This arrangement provides for an extension of the conduit system from the open end of the T fitting without disturbing the original conduit run. To facilitate the pulling of wires, long-sweep elbows should be used, so as to avoid sharp turns in the conduit system.

Fig. 3—Drives for Heat Dryer



ATTACK SANDROCK

+ With Duckbills and Rockcutters

By C. E. SWANN*
W. D. BRYSON†
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TWO rock tunnels have been driven recently, one by the Colony Coal Co., at Dines, Wyo., and one by the Union Pacific Coal Co. at Winton, in the same state, in which duckbills were used to push their way into the rock and forward it to shaking conveyor pans for loading. At the first operation, it was decided that a cross-measure tunnel should be driven to connect the surface tramway which serves mines 8, 9, and 10 with a point on Seam No. 15.

Decision was made to excavate the tunnel to the correct gradient by cutting the rock on the floor level with a coal-cutting machine. For this purpose a 16-in. feed was placed on a Goodman 12AA mining machine, the feed being cut in half by the use of a sheave on the jack pipe and the end of the feed rope being brought back to a hook on the side of the machine. The cutter bar was cut off to a 5-ft. length.

By the use of a special steel bit furnished by the Goodman Manufacturing Co., beds of shales and sandstone were cut without difficulty. Two limestone beds were encountered each about 2 ft. thick. These could not be cut by the machine. The total length of the tunnel when completed proved to be 570 ft., and because it was known that it would be of about that length, it was decided to drive it without laying track, though 570 ft. is too great a distance over which to operate a combination of one shaker conveyor and a duckbill. Experience has shown that the distance should not exceed 300 ft. Consequently, a shaker conveyor, which did not, of course, carry a duckbill, was installed behind the other shaker to receive the rock as delivered and forward it to destination.

Rock was not only transported to the mouth of mine but delivered over the side of the hill, thus entirely eliminating the need for mine cars. The total length of the rear conveyor when fully extended was 400 ft., making the total transportation distance 700 ft. The pan lines were suspended from the roof by the use of ½-in. chains. The gradient of the pan line ranged from 1 to 2 per cent against the travel of the rock, but the tunnel itself was driven level, the dimensions being 8x12 ft. It was timbered for about half its length with 10-in. wood crossbars on 5-ft. centers and top lagging.

Air was furnished by a Jeffrey blower fan equipped with 12-in. Ventube discharge line suspended on the roadway timbers. The day shift and night shift each consisted of two men who cut, drilled, and blasted the rock and loaded it with the aid of the equipment stated, timbered the tunnel, and extended the shaker troughs and air tubing. As no rock cars were used to haul the rock, two men constituted each shift and they averaged 1½ ft. of tunnel apiece. The cost was as follows:

	Total	Per Foot
Rockwork, labor only	$2,433.96	$4.27
Timbering (230 ft.) labor only	362.88	1.28
Total labor cost per foot timbered		$5.55

The other tunnel, located at Winton, was driven as part of the connection between the tipple and a new mine opening. This tunnel was to cut through two rounding projections on the outcrop and to come to light for a short distance between these two salients. The gradient of the tunnel, when completed, was to be ½ per cent in favor of the loads.

The north half of the tunnel, which will be termed Section A, was driven first and kept in the coal seam, which was 6½ in. thick, but unfortunately, the gradient proved not to be regular, though the level of the coal seam in the center of this section where it had been intersected by an old air-course was, strange to relate, almost exactly on the true gradient. Between

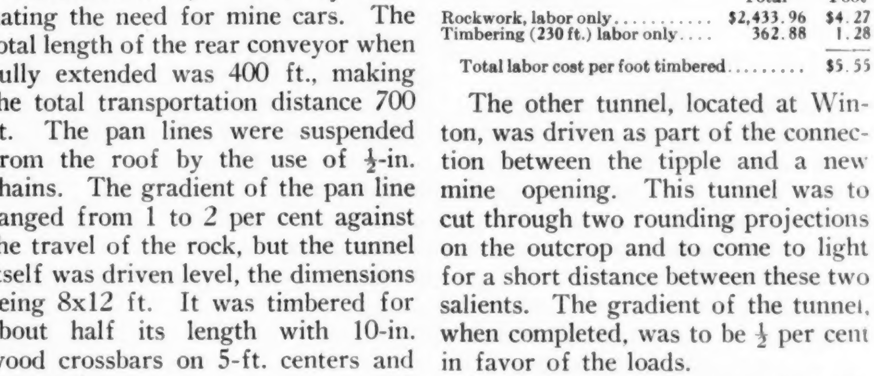

Fig. 1—Tramroad With Tunnels at Winton Mine

Abstract of article entitled "New Rock Tunnels at Dines and Winton, Wyo., Driven by Use of Shaker Conveyors Equipped With Duckbill Loaders" and read before the Rocky Mountain Coal Mining Institute, June 4-5, Denver, Colo.

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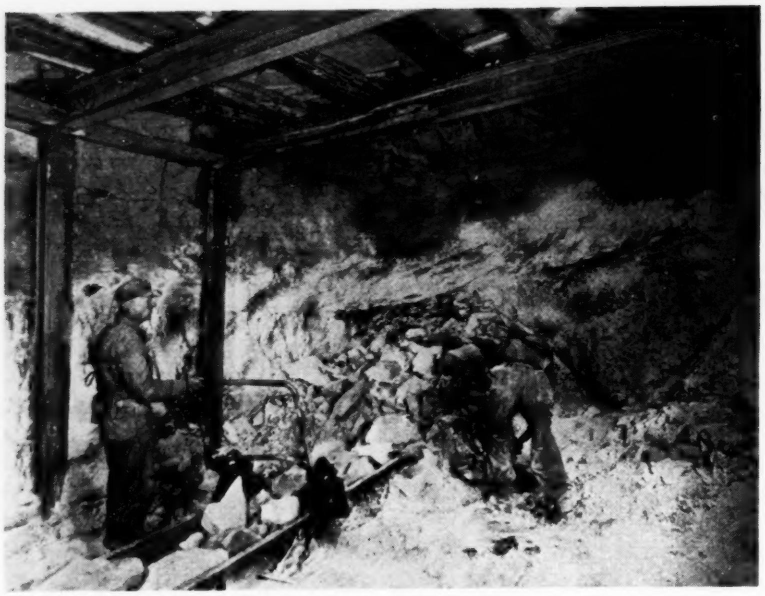

Fig. 2—Handling Sandrock by Duckbill in Sidetrack at Winton; Note 17-Ft. Steel Sets

the center of Section A and the ends, the coal rolled, making two humps. As the roof was bad and required close timbering, this section of the tunnel was driven by hand. When the northern end of Section A had been driven 200 ft. a shaker conveyor equipped with a duckbill loader was installed for its further extension.

A mining machine was provided to undercut the coal, and the northern end of Section A was extended south until it met the southern end of the same section. Then this section was graded by brushing the top and shooting up the bottom till a true gradient was established.

Profiting by the experience in driving Section A, the other section, B, was driven on a true gradient from one end to the other, and here the coal rolled even more than in Section A, causing this section to be practically a rock tunnel from end to end. The coal was so soft that it could not be supported without falls, even after the tunnel section was removed, and even the rock over the coal proved so weak and broken that it was controlled with difficulty. Consequently the tunnel varied in height from 8 to 14 ft.

This section was driven 12 ft. wide for 350 ft. and was then widened to 18 ft. for the remaining 290 ft., which length was to serve as a landing at the top of the main slope of No. 1 mine, which, like the coal seam, dipped at a steep angle. For the 350 ft., 12-ft. wood crossbars were used for support, but, after the widening to 18 ft., 17-ft. steel I-beams 10 in. deep were installed, 5-in. steel H-beams acting as legs. All timber and steel sets were placed on 5-ft. centers and well lagged on top. Because of the inability to secure the roof and make the place safe enough for a mechanical loading crew, the first 60 ft. was driven by hand. As soon as mechanical loading with duckbills was started, an attempt was made to cut the sandrock with a mining machine, but the rock was too hard, so a row of drill-holes on the grade line was substituted. These holes were heavily shot. The duckbill was found to work successfully, making its own floor as it advanced.

The shaker conveyors were suspended from the roof with $\frac{5}{8}$-in. chains; the duckbill, after being cut down to a length of 30 in., was welded to the ratchet pan, and the ratchet pan bars were extended down to the end of the duckbill, which was further strengthened by welding a steel rib along its center, this rib extending from a point about 10 in. back of the edge to a point far enough ahead of the shovel to allow it to be turned up. Thus the steel rib acted as a guiding shoe to raise the shovel over any obstruction. The ratchet dogs also were set just snug enough that they held until something unusually hard was encountered, and then they would slip and save the equipment from damage.

As far as could be arranged, the cycle of operations was as follows: The night crew, consisting of a ratchet man, loading-end man, and driver, would drill, shoot, and clean up the coal and also the rock thrown out by the top row of rock holes. If possible, they started to drill the bottom holes also.

The day crew consisted of ratchet man, face man, loading-end man, and driver. They finished the drilling of the bottom rock, shot the holes, cleaned up the dislodged material, and set the timber. Two men in an average of 4 hr. would place one 12-ft. wood crossbar or a 17-ft. steel set. In the wide part of the tunnel the entire job of loading 68 cars of muck and installing one steel timber set was performed in two 8-hr. shifts. The rock moved readily along the conveyor, but the coal at times was so soft and fine that it traveled with insufficient speed.

In driving the tunnel the shaker conveyor was set up twice, the first set-up driving 315 ft. and the second 327 ft. The cost of section B, which was largely in rock and 690 ft. long, was as in the accompanying table.

Cost of Section B, Tramway Tunnel, At Dines, Wyo.

	Per Foot
Drilling and blasting	$2.65
Loading and unloading	4.40
Timbering	6.33
Trackwork	3.46
Miscellaneous	0.50
Total cost	$17.34

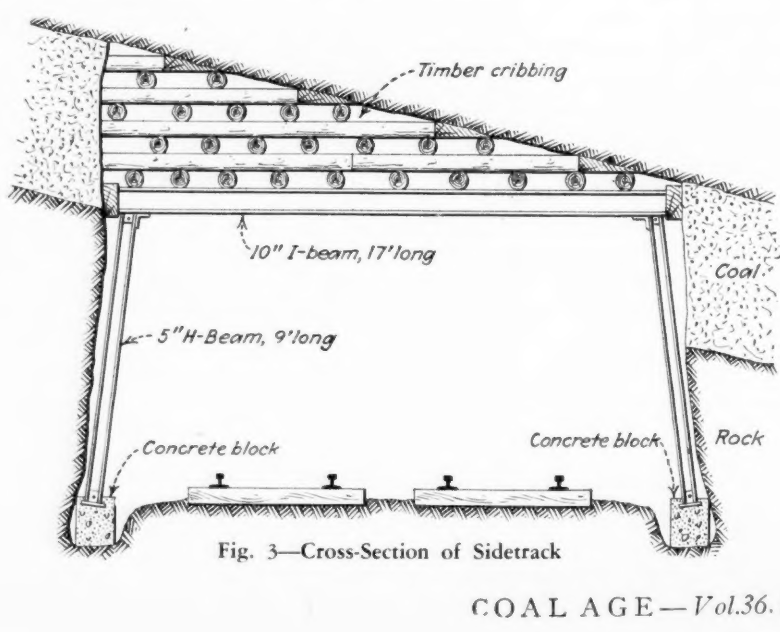

Fig. 3—Cross-Section of Sidetrack

HYDRAULIC BACKFILLING

+ As Europe Practices It

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HYDRAULIC backfilling, which in the anthracite region of Pennsylvania is generally designated "flushing," has been known to mining engineers for about 60 years. During at least four decades it has been the subject of much controversy and speculation, here and abroad. Some engineers regard hydraulic packing merely as a secondary item in the complete problem of roof control and subsidence; others give it an important place in a group of innovations which may ultimately lead to safer and more economical mining methods.

Generally speaking, the first viewpoint is held throughout the anthracite region of Pennsylvania, while the latter opinion is typical of current thought in coal-mining circles on the continent of Europe.

Although hydraulic backfilling was originated and first brought to practical use in the anthracite field, it must be admitted that it has gained the increased attention of coal-mining engineers throughout the world mainly from its large-scale adoption in European mines.

One of the earliest installations for backfilling was that of the Dodson Colliery, Plymouth, Pa., where Superintendent Davis introduced the practice in 1891. His purpose, however, seems to have been primarily to dispose of the silt and even the smaller grades of coal, which at that time could not be marketed. The rapid accumulation of such material, together with slate and other refuse, made necessary the purchase of large surface areas on which expensive refuse handling equipment had to be built. It was in the search for a remedy for this situation that the novel idea of flushing empty underground chambers was conceived. The use of flushing in connection with roof support came only as a result and not as a forerunner of the actual application. After a large quantity of silt had been flushed into the empty chambers, it was observed that the subsidence which the crushing of room pillars had hitherto caused was conspicuously absent in the backfilled area.*

Because of its ability to minimize or even prevent subsidence, hydraulic backfilling arrested the attention of European mining engineers when they were searching for a method which would permit the mining of coal seams under a densely populated area, where subsidence and damage done to surface buildings was not only costly but practically prohibited by law.

The first application of hydraulic backfilling in Europe was at a coal mine in Upper Silesia and occurred in about the year 1900. Since then it has found steady and increasing favor throughout the continent of Europe, not only in mines operating under built-up areas but also in mines with thick seams, where a large part of the pillar coal is likely to be lost if the seam is mined without backfilling.

In the 30 years of its application to European coal mining, the hydraulic packing method has brought about distinct changes in mining systems, due to realization of the fact that complete extraction of the coal can be attained only when the operations of mining the coal and backfilling the spaces are kept in proper relation, the one to the other. Herein lies the distinction between the development and application of hydraulic packing in America and in Europe.

Throughout the Pennsylvania anthracite field, flushing is generally considered only as a secondary, or auxiliary, mining operation, and empty chambers are backfilled only to prevent, or reduce, roof caving and subsidence, to stop dangerous squeezes, or at the most to recover a portion of the pillars. Usually, no attempt is made to combine coal extraction and flushing into a synchronized operation.

Hydraulic backfilling, here as well as abroad, consists essentially in the mixing of the solid packing material with water and conducting the mixture through the pipe line from the surface to the chamber to be backfilled. There the solid material is deposited, while the water drains off and is pumped back to the surface. We can therefore classify three major phases of the process, each with its particular requirement of machinery and equipment: (1) Mixing water in surface plant with material to be packed; (2) conducting mixture through pipe line; (3) deposition of backfill underground.

An attempt will be made to give in brief form some of the more important improvements which have been sought or accomplished in the application of hydraulic packing in Europe, and in pointing out the various developments of this process on that continent. Difference in methods is due to the variant conditions of different mines and to the

*It appears from p. 99, Bulletin No. 245, of the U. S. Bureau of Mines, "Mining of Thin Coal Beds in the Anthracite Region of Pennsylvania," by D. C. Ashmead, that silting was first practiced in the later sixties and in this instance for the express purpose of surface support. For many years no further use of this method of support was attempted.

many and vigorous requirements of the several mining laws, also partly to diverging views of mining men.

(1) *Mixing of Packing Material and Design of Surface Plant*—The mechanical construction and arrangement of the various devices for the preparation of the solid packing material and its proper mixing with water show much variation from mine to mine, due to local conditions and material available.

The materials used for hydraulic backfilling can be arranged in a scale of preference, at the top of which unquestionably stands quartz sand in its purest form. Sand has the great advantage that it can be used without previous crushing. When rock, slate, or refuse are to be used as a packing material, a crushing and conveying plant becomes necessary, and this greatly increases the cost. The sizes to which rock, refuse, or ash clinkers are to be broken depends on the diameter and the length of the pipe line, as well as on the water pressure available. The latter, of course, is fixed by the vertical distance between the surface and the seam which is to be backfilled.

Experience covering a period of many years has shown that maximum sizes from 2 to $2\frac{1}{2}$ in. can be flushed through short and nearly straight pipe lines. For long lines with many bends and rises, the biggest pieces of packing material should not exceed $1\frac{1}{2}$ in. In Europe, wherever crushed material is used, the material flushed rarely exceeds in diameter the sizes stated.

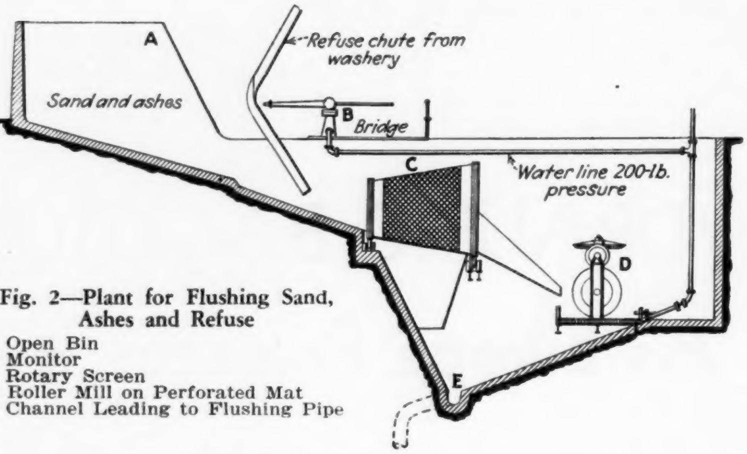


Fig. 2—Plant for Flushing Sand, Ashes and Refuse

A. Open Bin
B. Monitor
C. Rotary Screen
D. Roller Mill on Perforated Mat
E. Channel Leading to Flushing Pipe

Where it is available in large quantities near the mine, sand is used exclusively as packing material. It is brought to the mine from the sand pit in special dump cars. Sand can be flushed with less water than any other backfilling material. It gives a relatively incompressible support, and permits the water to drain off rapidly.

Only few mines, however, are in the enviable position of having a sufficiently large sand deposit in close proximity. Most mines are compelled to use a mixture of various packing materials. The kind of mixture used depends on what materials can be most economically obtained, on the experience gained in the use of certain materials, or on the judgment of the engineers as to the results likely to be derived from the use of designated mixtures under certain conditions.

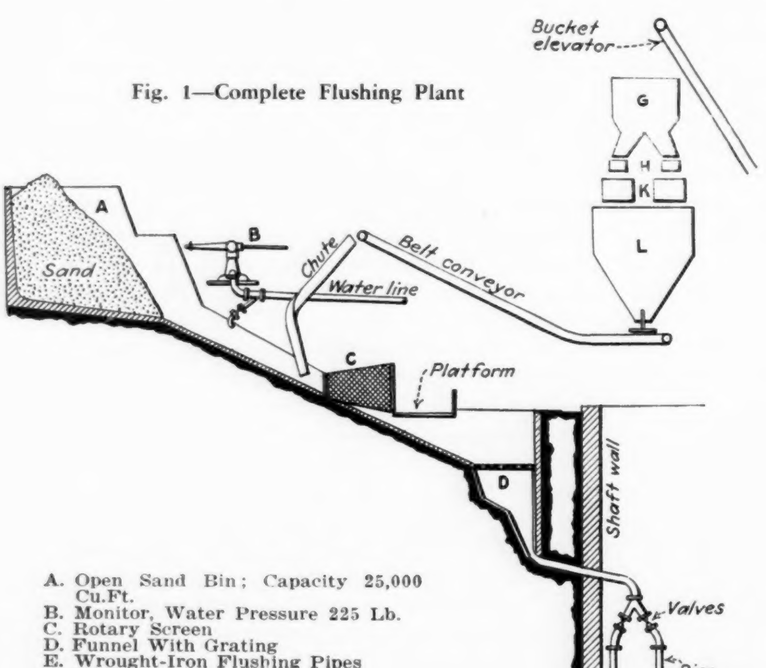


Fig. 1—Complete Flushing Plant

A. Open Sand Bin; Capacity 25,000 Cu.Ft.
B. Monitor, Water Pressure 225 Lb.
C. Rotary Screen
D. Funnel With Grating
E. Wrought-Iron Flushing Pipes
F. Distributor at Landing
G. Rock-and-Refuse Bunker
H. Magnet for Tramp Iron
K. Hammer Mills
L. Bunker for Crushed Material

In a certain mine, a mixture composed of equal volumes of sand, ashes and washery refuse gave a satisfactory backfill. Even under the heaviest pressure the material yielded only 12 per cent of its original volume. This could have been surpassed only by a backfill made solely of sand, which generally will lose no more under compression than 5 per cent of its former bulk, but which in this case was not available in sufficient quantities or at low enough cost. If only refuse and ashes had been used, the backfill would have shrunk at least 25 to 30 per cent. The sand fills the minute spaces between the irregular pieces of slate and clinkers and gives the backfill consistency and strength.

Where different materials are used for flushing, the ingredients are rarely mixed before being brought into contact with water, but are fed into the pipe line at different points, the sand being first mixed with the water and the other constituents added later.

In some European coal-mining areas, such as the Ruhr district in Germany, no sand is available as packing material. Crushed rock, silt, slate, ashes, and refuse from the washery are used instead. They require an elaborate preparation plant and because they are flushed in maximum sizes their distribution consumes a large quantity of water. Some of these materials render the water acid, thus corroding the pipe lines and pumps. Two typical installations for flushing a mixture of sand

and crushed materials are shown in accompanying Figs. 1 and 2.

Referring to Fig. 1, it will be noticed that the sand is dumped into an open bin, the floor of which has a pitch of 10 deg. This bin generally is built of concrete or brick. The floor is covered with hard glazed tile or sheet steel. Facing the open side of the bin are mounted one or two monitors which supply a stream of water from centrifugal pumps at a pressure of 150 to 225 lb. per sq.in. Thus the sand is thoroughly mixed with the water, as in hydraulic mining. The semi-liquid mixture flows toward an open channel leading to the vertical pipe line in the shaft. To prevent pieces of wood, large stones, or other undesirable material, which may clog the pipes, from entering the pipe line, the mixture is conducted

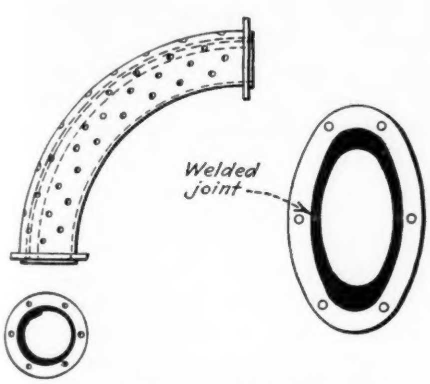


Fig. 3—Elbow and Underground Flushing Pipe

Left: Elbow of Eccentric Cross Section With Guiding Rib and Signal Holes. Right: Reversible Oval Pipe of Two Reinforced Segments Welded Together

through a slowly revolving rotary screen. Here all such material is retained and occasionally picked out by hand.

Crushed rock and washery waste are introduced into the sand stream before it enters the rotary screen. The crushed material comes from the crushing plant, which usually consists of a combination of gyratory crushers and hammer mills. A rotating distributor under the bunker gate insures a constantly uniform feeding of crushed material into the flushing current. This feeding device is adjustable so that automatically any percentage mixture can be obtained.

Additional water is allowed to flow into the channel where necessary to assure smooth running. A few minutes before and after each flushing operation water is sent through the pipe line to wash away any solid material which may have settled in the elbows and valves or at other points.

The funnel connecting the open channel with the vertical pipe line is considered an important part of the plant. It is shaped and placed in such a fashion that the flushing current will enter the pipe line without drawing in any air, thus eliminating air knocks, which may prove injurious in long pipe lines where the pressure is enormous.

Fig. 2 depicts a flushing plant of smaller capacity than that in Fig. 1 and one designed for handling a mixture composed of clayey sand, ashes, and washery refuse. This kind of plant generally is favored where the flushing material is not taken through a pipe line in the shaft, but is conducted to some distant point where it is fed through a borehole.

(2) *Conducting Mixture Through Pipe Line*—Initial and maintenance cost of the pipe line are the biggest single cost factors in the economy of hydraulic packing. It is for this reason that no other unit of the plant has received more attention or has been subjected to more changes and improvements. Experiments and trials covering many years have been made with pipes of all shapes and materials; yet the problem is still far from being solved satisfactorily.

From ordinary wrought-iron or cast-iron pipes, the search for better conduits progressed to pipes made of wood, bronze, and manganese steel. As none of these materials reduced abrasion sufficiently to warrant the higher initial cost, steel pipes lined with glass, rubber, porcelain, or terra cotta were tried, but soon discarded. In every case the increased life of the pipe line could not be justified by the increased cost, and finally wrought-iron and cast-iron pipes regained a predominant position.

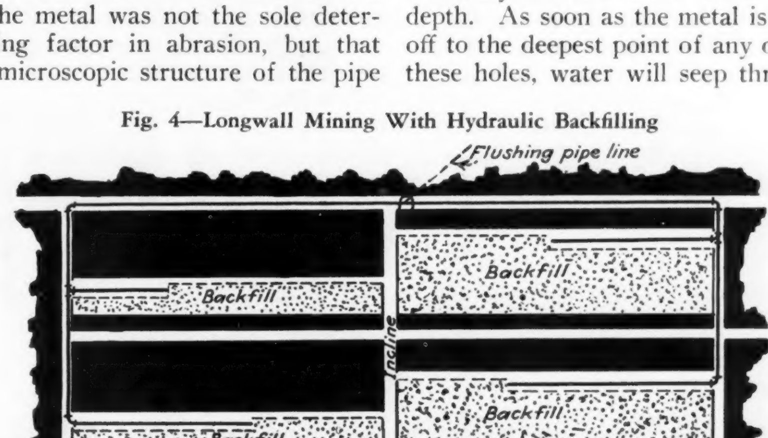
Throughout all these costly experiments it was found that the hardness of the metal was not the sole determining factor in abrasion, but that the microscopic structure of the pipe was an important element in its expectancy of life. For this reason wrought-iron pipes of a homogeneous structure were found to be most economical of any in withstanding abrasion. Today, the vertical portion of the pipe line in nearly every well-designed flushing plant is equipped with wrought-iron pipes of the seamless type, and cast-iron pipes are used underground, because of their lower cost.

It is obvious that elbows and bends are subject to more pressure and abrasion than the straight portion of the pipe line. Furthermore, unlike the straight portions of the pipe, they cannot be turned to prevent the excessive wear that may occur at any one spot. Elbows must, therefore, be considered as the weakest points in a pipe line; they make the carriage of silt in pipes under heavy pressure dangerous. Once they are worn to such an extent that the water pressure exceeds the ultimate strength of the metal in the thinnest portion, they not only crack but burst with hazard to human life. The sudden breaking of an elbow may cause much damage to the mine, as the flushing material will flood or even choke the gangways before the accident is noticed.

To overcome the inherent weakness of the ordinary elbow, the thickness of the metal has recently been increased in that part of the filling which is particularly subjected to abrasion. Furthermore, a longitudinal rib is provided inside the elbow to prevent the current from acquiring a spiral motion and to lead the greater part of the solid material along that portion of the wall where the thickness is greatest.

In order to have an indication when abrasion has actually reached the danger limit, a number of small holes are drilled from the outside into the body of the elbow to a given depth. As soon as the metal is worn off to the deepest point of any one of these holes, water will seep through,

Fig. 4—Longwall Mining With Hydraulic Backfilling



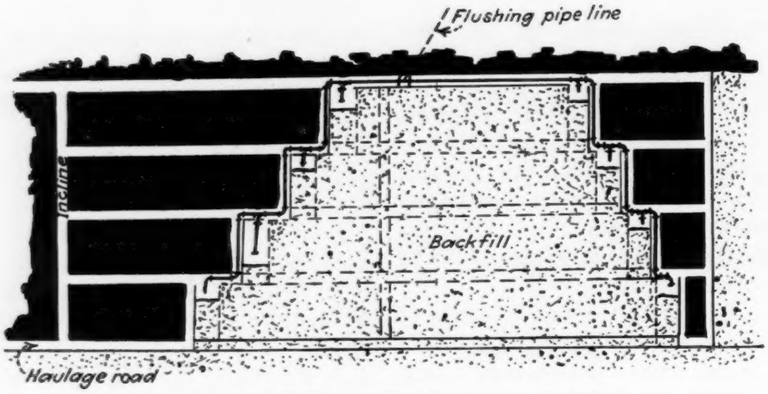


Fig. 5—Shortwall Mining With Hydraulic Backfilling

indicating that the elbow should be replaced.

These same features, which were found to give excellent results in elbows, are now incorporated also in straight pipes. Longitudinal ribs are drawn into the pipes of the vertical pipe line in order to prevent the current from traveling in spirals. This provision reduces abrasion and causes the current to travel with less resistance.

For the horizontal portion of the line underground, oval pipes with an increased wall thickness are claimed to give excellent service. They have gained much favor, because they are supposed to cause the flushing material to travel uniformly and without turbulence. Such pipes have also an appreciably increased life, yet the additional cost is small. They are made by welding together two troughs with a wall thickness of about $\frac{7}{8}$ in. at either end of the vertical diameter. Toward the sides the thickness of the walls is gradually reduced to $\frac{1}{4}$ in. The material used is a special hard Siemens-Martin steel with an ultimate strength of 100,000 lb. per sq.in. In service these pipes can be turned once, thus doubling their life.

Actual figures as to the life of a pipe line are available but they vary over such a wide range that no generalization can be safely attempted. Careful installation, strict supervision and, still more, the kind of material flushed determine largely the life of a pipe line.

As to the pipe diameter, it seems almost universal practice to use a 6-in. pipe for the vertical portion of the pipe line and an 8-in. pipe for the horizontal or inclined portions. In a certain mine, where the entire pipe line, vertical and horizontal, consisted of 6-in. pipes, the ratio of solid material to water was 1 to 5. After the horizontal line was built of 8-in. pipes, this ratio could be made 1 to 3, effecting an appreciable saving in pumping costs.

Most mines, especially those which adopt a strict correlation of mining and flushing, have two pipe lines installed in the shaft, one of which is considered a reserve. The distributor at the end of this dual pipe-line installation is of special importance and should be designed for long service. Its lower part, which the flushing current strikes, is subjected to heavy abrasion. Therefore it is made with a bulge which can be filled with an abrasion-resisting material. A special cement producing an extremely hard filler generally is used for this purpose and is economical, as it can be easily repaired or replaced.

Fig. 6—Modified Room-and-Pillar System With Hydraulic Backfill

(3) *Deposition of Hydraulic Backfill Underground in Connection With Various Mining Systems*—From a purely theoretical standpoint hydraulic packing can be applied to any mining system. The full advantages of the process, however, are obtained only in operations where backfilling and extraction of coal are made into synchronized phases of one single system.

In European coal mines, hydraulic backfilling has been combined with long-face and shortwall mining with a marked degree of technical success and economy. At the present time, however, it is considered most adaptable to a modified room-and-pillar system, of which it is made an integral part and with which it is welded into a system of its own.

Figs. 4 and 5 show diagrams of the application of hydraulic packing with long-face and shortwall mining, respectively. Fig. 6 depicts the more ideal practice of a modified room-and-pillar system combined with hydraulic backfilling.

The barriers to hold back the packing are built of props to which chicken wire and burlap are nailed. Wood planks generally are too expensive for barriers. Where slate or rock from roof falls or partings are available, they are often used to build the barriers wholly or in part. Special care is taken to secure a tight backfill against the roof, so that no treacherous crevices are left there. This is accomplished by pointing the end of the pipe line upward and letting the backfill at all times slope toward the end of the pipe instead of away from it.

In deep mines and in those where hydraulic backfilling is practiced on a large scale, the collection and pumping back of the water becomes quite a problem and an item of heavy expense. In facing this problem an entirely new packing process has been evolved in which instead of a current of water, one of air is used to carry the solid packing material through the pipe line. Pneumatic packing, its present development and its future will be considered in a later article.

STORAGE BATTERIES

+ In Illinois Mines—I

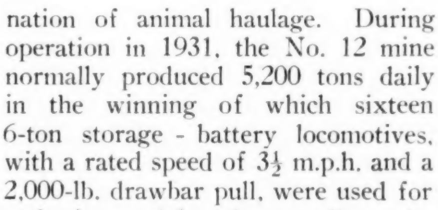
RECENT years have witnessed a sharp increase in the percentage of storage-battery locomotive sales in the mining industry. Figures collected by the U. S. Department of Commerce show that 25.2 per cent of the locomotives of all types newly installed underground in 1926 were of the storage-battery type; 27.8 per cent in 1927; 36.3 per cent in 1928; 38 per cent in 1929; and 39.5 per cent in 1930.

Study of storage-battery application under a variety of operating conditions has developed a number of factors which are heightening interest in this type of power, particularly for gathering haulage purposes. Improvements in battery design and construction have reached a stage where reliability of performance can be assured under a widening range of conditions. Controlled maintenance is extending the useful life of the cells to a greater number of operating shifts; through better charging methods, less of the applied energy is dissipated.

Improvements, too, have been made in locomotive design which add measurably to the efficiency derived in converting the stored electric energy into mechanical power. A clearer understanding is being gained of the full scope and limitations of battery application. Finally, for reasons entirely apart from those involved in the choice of power supply in hand-loading mines, mechanization methods are cutting new niches for utilization of the storage battery underground.

Three of the mines covered by the survey upon which these conclusions are based are in the No. 6 seam in Illinois. At one, the coal is loaded by hand; at the second, loading machines are used; at the third, the coal is handled with pit-car loaders. In each case, storage-battery locomotives are utilized for gathering. In every case, economy and general operating advantages were prime considerations in the choice of equipment.

The hand-loading operation is the No. 12 mine of the Madison Coal Corporation, which is located near Carterville, Williamson County, Ill. This company up to the time of the recent suspension of its operations, had been using storage-battery locomotives since 1916, when necessity for cost cutting suggested the elimination of animal haulage. During operation in 1931, the No. 12 mine normally produced 5,200 tons daily in the winning of which sixteen 6-ton storage - battery locomotives, with a rated speed of $3\frac{1}{2}$ m.p.h. and a 2,000-lb. drawbar pull, were used for gathering, and four large trolley units for main-line purposes. In addition to these, four combination battery-trolley locomotives were in service, their duty being confined to utility service, chiefly for the distribution of supplies.


MONTHLY BATTERY PERFORMANCE RECORD

MINE No ______ MONTH ______ 19__

Average weight of cars this month ______

BATTERY No.										
Date	Cars Hauled	Car Miles	Cars Hauled	Car Miles	Cars Hauled	Car Miles	Cars Hauled	Car Miles	Cars Hauled	Car Miles

Fig. 1 — Monthly Report by Days on Gathering Performance, Madison Coal Corporation

Grades in this mine are considered by no means favorable to the use of storage batteries for gathering. In the working areas, grades of 2 to 3 per cent are more the rule than the exception. In two of the territories, battery locomotives were used on grades up to 12 per cent. To gather the normal day's output, the gathering locomotives handled an average of 325 tons, or about eighty 4.1-ton cars. These cars are equipped with hollow axles, bronze bushed. It was not unusual for one locomotive to gather 90 cars in eight hours; in some instances they handled in excess of 100 cars in a shift; but in these cases grades and general conditions necessarily were better than the average. Where grades were stiff, the gathering task lay between 50 and 60 cars.

Several reasons are behind this high-rate performance. Partings were moved forward at frequent intervals, generally when the average haul in the panels reached 1,000 ft. Table I lists the average haul of all working sections in the mine as of March 1, 1930. The maximum, it will be noted, is 1,309 ft., and the minimum 312 ft. An average of these averages for the entire mine is 779 ft. Constant attention was given to the condition of track, chiefly as to alignment and cleanliness. Systematic maintenance methods were followed, and individual batteries were assigned to the service in which they would perform to the best advantage; that is, the batteries in the best condition were assigned the most difficult territories.

By a system of close control the electrical department kept in possession of currently developed data, which enabled it to pass judgment on the performance of any gathering locomotive and crew in relation to conditions encountered on the run. The system involved periodic conducting of performance tests, which were used as a basis of service comparisons. In the making of these tests, the engineering department lent a hand.

Every six months the engineering department established a gathering course in every section of the mine, over which a test train was run and

power readings were taken. These courses were laid out to be representative of all hauls in the section, both as to distance traversed and grades negotiated. The length of haul was fixed definitely by measurement. In the case of grades, however, dependence was placed on the levels established by customary mine surveys, as recorded on the maps, and on the general knowledge of the staff as to the inclinations of the seam in rooms.

The test train consisted of three empty cars and a locomotive powered by a storage battery which could be relied upon to maintain a constant voltage throughout the shift. These three empty cars gave an appreciable power reading without draining the battery to the point where the voltage tapered off. The train was run from the center of the parting to the end of the course and return. Power-consumption readings were taken each way, the readings for both ways were combined, and the resultant then was reduced to ampere hours per 100 ft. of haul in the round trip. A record of these data appears in Table I.

Table I—Gathering Haulage Test Data as of March 1, 1930, No. 12 Mine, Madison Coal Corporation

Entry	Average Haul Miles	Average Haul In C.Ft.	Ampere Hours In	Ampere Hours Out	Ampere Hours per C.Ft.	Grade Constant	Theoretical Distance Miles
5 and 6 W. S.	.136	7.20	6	4	.694	2.8	.38
7 and 8 W. S.	.153	8.10	4	1.5	.339	1.4	.21
11 and 12 W. S.	.085	4.49	2.5	1.5	.445	1.8	.15
3 E. S.	.172	9.12	2.5	2.5	.274	1.1	.19
5 and 6 E. S.	.091	4.84	2	3	.516	2.1	.19
7 and 8 E. S.	.095	5.01	2.5	2	.450	1.8	.17
11 and 12 E. S.	.048	2.54	2.5	1	.688	2.8	.13
7 and 8 E. N.	.133	7.04	2	4	.355	1.4	.19
9 and 10 E. N.	.129	6.80	2.5	1.5	.294	1.2	.15
11 and 12 E. N.	.237	12.51	3.5	3	.260	1.04	.25
13 and 14 E. N.	.172	9.08	2	2.5	.247	.99	.17
15 and 16 E. N.	.169	8.94	2.5	2.5	.279	1.12	.19
17 and 18 E. N.	.169	8.96	2.5	2.5	.279	1.12	.19
3 and 4 W. N.	.192	10.15	3	2.5	.271	1.08	.21
5 and 6 W. N.	.192	10.15	3	2.5	.271	1.08	.21
7 and 8 W. N.	.214	11.31	4	2.5	.287	1.1	.23
9 and 10 W. N.	.083	4.39	1.5	2	.398	1.6	.13
11 and 12 W. N.	.248	13.09	2.5	5.5	.306	1.2	.30
17 and 18 W. N.	.06	3.12	1.5	2.5	.641	2.6	.16
19 and 20 E. N.	.158	8.36	3	4	.418	1.7	.27
19 and 20 W. N.	.158	8.36	3	4	.418	1.7	.27

Initial tests were made in 1928. One of these was made in a section of the mine where grades were practically level. The result of this particular test—a power consumption of 0.25 amp. hr. per 100 ft. of round-trip haul—which had been proved correct in subsequent tests under similar conditions, was accepted as the unity base. The ratio of every other reading to this base gives a grade constant for the particular haul tested.

The grade constant for a given haul multiplied by the distance traversed in that haul gives a result equivalent to a haul on level track, or the theoretical distance, which is recorded in miles. This theoretical distance multiplied by the number of cars hauled gives the number of car-miles per battery shift. These calculations were made and recorded daily for every battery, on the form shown in Fig. 1. By reducing all performances to a level-track basis, a common denominator is derived for comparing the performance of one battery with another regardless of difference in conditions. However, further allowance must be made for the fact that no battery will do as much work at abnormal as at normal discharge rate. This allowance is best made by working all batteries being observed equal time in each territory.

Fig. 2—Records of Battery Life and Performance Are Kept on This Form. The Figures Are Actual Record of One Battery in Service at the No. 12 Mine of the Madison Coal Corporation

BATTERY LIFE RECORD

Mine No. 12 — Calculated as level track equivalent

	Month and Year	No. Days Worked	No. Cars* Hauled This Month	No. Cars* Hauled Total to Date	Car Miles This Month	Car Miles Total to Date	Power Consumption Kw.-Hrs This Month	Power Consumption Kw.-Hrs Total to Date	Power Consumption Kw.-Hrs Per Car Mile
Make									
Manufacturers No.									
Mine No. of Battery †	Dec. 1928	5	408	408	138.72	138.72			
Date Installed 12-15-1928	Jan. 1929	13	1148	1556	387.84	526.56			
Date Removed (Life not exhausted)	Feb	16	1357	2913	458.80	985.36			
No. Months in Service	Mar.	11	1114	4027	306.42	1291.78			
No. Months Worked	Apr.	10	1056	5083	263.6	1555.38			
Net Cost	May	13	1279	6362	320.9	1876.28			
Total Ton Miles (Level track)	June	6	561	6923	139.9	2016.18			
Depreciation per Ton Mile	July	10	907	7830	227.2	2243.38			
Total Kw.-Hr. used	Aug.	10	975	8805	245.0	2488.38			
Kw.-Hr. per Ton Mile	Sept.	8	731	9536	206.8	2695.18			
Remarks	Oct.	14	1233	10769	481.8	3176.98			
* Average car capacity	Nov.	17	1492	12261	596.8	3773.78			
4.1 tons.	Dec.	18	1504	13765	593.4	4367.18			
	Jan. 1930	16	1282	15047	512.8	4879.98			
	Feb	15	1189	16236	475.6	5355.58			
† 48 cells, 33 plate;	Mar.	12	1080	17316	296.8	5652.38			
Capacity 544 amp. hr.	Apr.	11	966	18282	201.8	5854.18			
Expected life 45 months	May	8	579	18861	115.8	5969.98			
	June	8	740	19601	148.0	6117.98			
	July	6	571	20172	114.2	6232.18			
	Aug.	7	647	20819	129.4	6361.58			
	Sept.	8	786	21605	157.2	6518.78			
	Oct.	13	1246	22851	249.2	6767.98			
	Nov.	13	1211	24062	242.2	7010.18			
	Dec. 1931	16	1402	25464	280.4	7290.58			
	1931	Forwarded		25464		7290.58			
	Jan.	11	951	26415	192.1	7482.68			
	Feb.	11	986	27401	198.1	7680.78			
	Mar.	11	884	28285	176.8	7857.58			
	Apr.	10	694	28979	138.8	7996.38			

This system takes an accurate measurement of storage-battery performance under a wide variety of conditions and supplies pertinent data to the records on battery life. The form used by the Madison company for recording these refined details appears in Fig. 2. The system properly applied allows no room for a false interpretation of performances of two makes of batteries under dissimilar conditions. Without the gage furnished by such a system the performance of one battery applied to short hauls and easy grades might wrongly be accepted as superior to the performance of a better battery which hauls fewer cars but over longer distances and/or heavier grades.

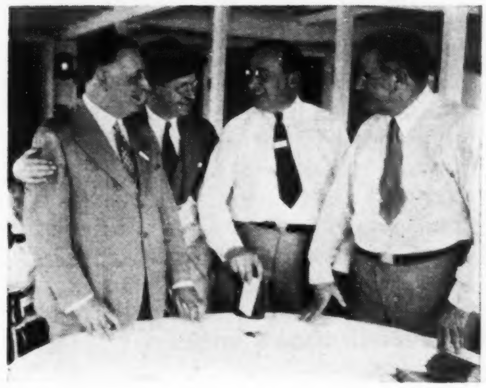
This system also provides a check on the accomplishments of locomotive crews. Servis recorders were sometimes installed on locomotives to check movements and delays. Under this provision, no crew can talk away its shortcomings with the excuse, "We can't be expected to haul as many cars as John and Bill; our grades are much heavier."

Finally, the grade constants and other related data give a direct check on the condition of track. If a test run develops a grade constant which is higher than that for the previous test in the same section, and grades remain unchanged, it becomes plainly evident that the track should be cleaned or aligned, or both. Such

(*Turn to page 363*)

ILLINOIS INSTITUTE

+ Considers Problems Of Inside Modernization



Institute Officers on Deck—Left to Right: J. D. Zook, Geo. C. McFadden, B. E. Schonthal, and W. J. Jenkins

PROBLEMS of inside modernization had first place at the summer meeting of the Illinois Mining Institute, held on the chartered steamer "Cape Girardeau," June 5–7, during a round trip between St. Louis, Mo., and Cape Girardeau, Ill. The relation between underground mechanization and top-works preparation, increasing the life of cutting bits, safety, and welding were the major themes discussed.

"If coal under 2 in. did not need cleaning with hand loading, it will not need cleaning with mechanical loading," declared Lee Haskins, Bell & Zoller Coal & Mining Co., in a paper on "Practices Relating to Mechanized Operation," at a session presided over by W. J. Jenkins, president, Consolidated Coal Co. of St. Louis. It was his belief that 2- to 6-in. coal could be hand-picked by proper splitting of the feed over several tables.

Exception to this doctrine was voiced by John A. Garcia, Allen & Garcia Co., Chicago, who stated that "our experience all over the United States is that mechanization increases the percentage of impurities and that even the minus 2-in. coal must be cleaned." Getting satisfaction from a dry cleaning plant, he added, is more a matter of adjustment than of first selection of equipment. Nevertheless, there are some coals which cannot be cleaned successfully by any dry system now available.

High-wage scales, according to Mr. Haskins, gave the impetus to the rapid mechanization of underground loading in Illinois. Last year in that state 57 per cent of the coal was machine-loaded, 28 per cent was hand-loaded, and 15 per cent was produced by strip mines.

Discussing systematic maintenance of Joy loaders, Mr. Haskin stated that it is the practice of his company to use a special crew for oiling, inspection, and repair, and that printed forms for recording all details are filled out by the crew. Should one of these machines break down on the following day, the leader of that repair crew is asked to make an explanation. It is the practice to make only what minor repairs are necessary for one year and then put the machine in the shop for a general overhauling.

Operators, said J. W. Starks, superintendent, Peabody Coal Co., Taylorville, Ill., might just as well make up their minds that they must build tipples and cleaning plants if they expect to stay in the market. "The ash content must be lowered, if we are to continue to sell to the railroads, which are our best customers."

J. W. Stedelin, president, Marion County Coal Co., Centralia, Ill., felt that the management should never be satisfied with a certain tonnage per loading machine but should always be trying for an increase. He said his company has just started a report system on the forms of which are noted machine troubles, number of cars loaded, repairs made to the machine, and so on. He called attention to the desirability of weighing the coal so as to have a closer check on loading-machine performance.

C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri, St. Louis, Mo., declared it is necessary to sell the idea to the workman who is operating the loading machine that he himself is benefiting from the introduction of the machine into the mine. At the Taylor mine, operated by Mr. Sandoe's company, 360 tons per machine is averaged with cars holding but 2,100 lb. (see *Coal Age*, Vol. 36, p. 295).

Joseph D. Zook, president of the institute, suggested the use of a new term in place of "mechanization," to cover inside modernization.

Since cutting-machine bits have been tipped with Stellite, said H. H. Taylor, Jr., general manager, Franklin County Coal Co., Chicago, production per bit had increased from approximately 1 ton to as much as 3 tons. The cost of bits delivered to the face had increased, but labor, power, maintenance, and fixed charges had been reduced. Power cost on cutting was reduced 21 per cent and mining-machine maintenance was halved. These savings, he thought, were due in large measure to the use of the treated bits.

At the present time, he continued, his company is making tests with bits tipped with "Type N Composite" rod (Stellite). Preliminary tests indicated a production of 4½ to 5 tons per bit taken into the mine. Mr. Taylor explained that the goal is to provide bits which will not require changing during a shift, but said that his company is still a long way from this goal. Stellite is applied on the top of the bit for a distance about ½ in. from the point. The first four or five times that the bits are taken to the shop, they are merely retouched on an emery grinder; then they are reheated, repointed in the roller sharpener, and a new coating of Stellite is applied to them.

W. C. Argust, division superintendent, Peabody Coal Co., Taylorville, Ill., said his company tried two types of tipped bits, but on account of the pyrite in the seam these bits failed to show a saving. He suggested the possibility of making grooves on the sides of the point of the bit along the top edges and filling these with hard material.

Stellite bits were tried a few years ago on McKinley loaders at the New Orient mine, but the Stellite "popped off," remarked H. A. Treadwell,

general superintendent, Chicago, Wilmington & Franklin Coal Co., Benton, Ill. About two months ago the company became interested again and this time applied the Stellite for a ½-in. length after putting the bits through a Sullivan roller sharpener and grinding the tips. On a test the tonnage cut per bit was increased from 2 tons up to 7.4 tons, and the average is now close to 6 tons.

The bits are reground twice and then rerolled and re-Stellited. So far, no increase in the number of broken bits has been noted. Better success is being attained with the standard type chain and Stellited bits than was obtained from special chains. Electric welding has proved superior to gas welding for applying the Stellite. Mr. Treadwell added that on a certain type of machine having an inherent weakness, breakdowns were eliminated by adopting the improved bits. One cutting machine can now cut regularly for two loading machines.

Mr. Starks said that when bits encounter the hard pyrite they must bend or break; therefore it is the practice of his company to temper the bits so that they will bend. He has found that the ordinary-priced steel bits tempered in plain water show the lowest cost. In No. 7 mine 1,100 tons per day is being cut per machine with ordinary bits and with a performance of about 1 ton per bit.

If bits are tempered all of the way or if off-standard setscrews are used, made perhaps by some firm other than the mining-machine manufacturer, there will be a big loss of steel, continued Mr. Stark. He declared that the tonnage efficiencies per machine are not up to the point where the time required for changing bits materially affects the quantity of coal cut.

T. J. Thomas, president, Valier Coal Co., Chicago, said that the experience of that company with treated bits has been practically the same as that outlined by Mr. Taylor. The tonnage per bit was increased from just above 1 ton up to between 4 and 5 tons. He estimated that $100 per day would be saved in the Valier mine if bits could be obtained which would stand up for a full shift.

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Mr. Treadwell made a comparison between the number of accidents with loading machines and those with pit-car loaders operating in the same territory. When compared with the accidents in hand loading the reduction with loading machines was large. With pit-car loaders accidents were slightly increased. He said that perhaps the men on pit-car loaders thought that they had been relieved of the duty of protecting themselves.

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VOLUME vs. PROFITS—III

+ How One Operating Company Budgeted Costs to Escape Red Ink

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THE individual bituminous coal operator desirous of trying the experiment of predetermining costs and volume to insure profitable operation on the basis of actual market demands will find two bases available upon which to erect his organization. His plant may be operated 300 days per year at two-thirds of its daily capacity or 200 days at full daily capacity. This choice must be made from a knowledge of the individual plant conditions and from information which will be made available by the further development of his critical analysis of costs. An outline for the start of this analysis was given in the preceding article on "fixed costs" (*Coal Age*, Vol. 36, p. 313). The routine and detail of reassembling the organization, however, may, perhaps, be most clearly presented if a definite case be taken as an example and developed as it would be in practice.

The company we will use has fought stubbornly against a declining sales price and finds its business going to its competitors. The plant has a productive capacity of 30 cars, or 1,500 tons, daily, but shipments have already fallen to 400 cars per month, and with the decreasing sales realization, losses are being incurred. Accounting records show that profit ceases when shipments fall below 22,000 tons per month at $1.10, or below 25,000 tons at $1.075. In spite of the best efforts of the sales department during the previous month, shipments were only 20,000 tons and the net price per ton was $1.095. The sales force reports that competitors are booking orders at $1 and insists that it must have the same price if tonnage is to be held.

The records show that at $1 per ton, the crossover between income and outgo, or the profit and loss point, rests on a production of 37,000 tons per month, and it does not seem possible to sell this tonnage even at the prevailing price nor is it possible to produce so closely to the capacity of the mine, as development work has not been kept at the point where such production is possible.

It is evident that something must be done and a wage cut is considered, as the scale is still approximately 5c. per hour and 6c. per ton higher than other mines in the district. Investigation disclosed, however, that a cut to the level of the other mines would not, of itself, be sufficient to meet the necessity and it was decided that this would not be done unless there was the possibility of reducing costs in other ways to such an extent that the wage cut would put costs in line to at least break even on the market price.

Briefly stated, the problem was to obtain costs that would permit the profit and loss point to rest on a production of not more than 20,000 tons per month at an average net sales realization of not to exceed $1 per net ton. With this analysis of the problem, it was more clearly seen that the organization must be brought to that of a twenty-car mine rather than that of a thirty-car mine, which was the point at which it had been previously maintained.

In reaching this decision, the following points were discussed:

1. Past experience justified the belief that 20,000 tons could be sold on a competitive price.

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6. That it would be desirable to book just sufficient tonnage at the low prices to assure reaching the crossover, or profit and loss, point.

It may be noted here that, theoretically, should the entire industry reduce costs so that the profit point would rest on the lowest possible tonnage and price, and should this tonnage prove to be below the market consumption point, the producers would immediately create a sellers' market by booking only sufficient tonnage to take up the profit point capacity.

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general superintendent, Chicago, Wilmington & Franklin Coal Co., Benton, Ill. About two months ago the company became interested again and this time applied the Stellite for a ½-in. length after putting the bits through a Sullivan roller sharpener and grinding the tips. On a test the tonnage cut per bit was increased from 2 tons up to 7.4 tons, and the average is now close to 6 tons.

The bits are reground twice and then rerolled and re-Stellited. So far, no increase in the number of broken bits has been noted. Better success is being attained with the standard type chain and Stellited bits than was obtained from special chains. Electric welding has proved superior to gas welding for applying the Stellite. Mr. Treadwell added that on a certain type of machine having an inherent weakness, breakdowns were eliminated by adopting the improved bits. One cutting machine can now cut regularly for two loading machines.

Mr. Starks said that when bits encounter the hard pyrite they must bend or break; therefore it is the practice of his company to temper the bits so that they will bend. He has found that the ordinary-priced steel bits tempered in plain water show the lowest cost. In No. 7 mine 1,100 tons per day is being cut per machine with ordinary bits and with a performance of about 1 ton per bit.

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was the disintegration of the outgo into "Classification of Cost Items" as shown in the first column of the "Standard Unit Cost" sheet, Table I.

In consultation with the operating department, decision was made as to which sections must be worked daily to keep the mine in condition, the number of working places they contained and the number of miners they would accommodate. From this base, the data shown in the second column of Table I were developed. Past records gave information as to the number of tons per loader and the average weight per pit car. These figures set the minimum daily production at 492 tons, or 9,840 net tons per month of twenty days.

At this point, past records and the existing organization were forgotten and the development of the balance of the operating force was from the point of view that a 10-car operation was being manned. No surplus labor was carried, jobs were consolidated wherever possible, but one spare man was allowed and the actual hours required at work were used. For instance, the capacity of the tipple was such that 492 tons would be handled in not to exceed five hours; so, on this base, the tipple day was set at five hours. Later on, in actual practice during the testing of this schedule, it was found that it was better to operate the tipple on alternate days and that the loading of two days was dumped and properly screened by the same tipple crew in 7 to 8 hr.

At but one point were the previous records again used in setting up what have previously been described as "fixed costs" and that was in establishing the allowance made for "deadwork." The records gave the average expense required monthly to take care of this work and this amount was prorated on a twenty-day per month basis as shown.

After the organization had been developed for this small tonnage on the basis of the required jobs rather than on personalities or the men of the existing organization, the extensions were made in the first base-tonnage column and it was then possible to determine the per ton cost both in total and also by classification of expense or outgo items. This compilation represents the group "fixed costs," including both "shut-down" and "nucleus" costs. In the particular case under examination, the shutdown costs were not separately developed and it was discovered afterward that in not doing so, proper proportions were not at once obtained between portions of the "general and administrative" expense and the reduced size of the operation for which the reorganization was being made.

Then the operating department was asked, "What is the section which could be most advantageously placed

Table I—Standard Unit Cost Sheet

NOTE: All computations except as may be noted are figured on the basis of 20 working days per month.	Monthly Tonnage 9,840 No. 9 Right 60 No. 11-12-13 Right 216 No. 12-13-14 Left 216 Tons Daily 492 Loaders 40 Av. Tons per Loader 12.3 Mine Cars 256 Av. Cwt. per Car 38.44					Monthly Tonnage 13,200 Add to items in preceding column No. 18 Left 168 Tons Daily 660 Loaders 54 Av. Tons per Loader 12.22 Mine Cars, total 344 Av. Cwt. per Car 38.37					Monthly Tonnage 17,040 Add to items in preceding column No. 21 Left 192 Tons Daily 852 Loaders 70 Av. Tons per Loader 12.17 Mine Cars, total 440 Av. Cwt. per Car 38.73					Monthly Tonnage 21,360 Add to items in preceding column No. 22 Left 216 Tons Daily 1068 Loaders: 88 Av. Tons per Loader 12.13 Mine Cars, total 548 Av. Cwt. per Car 38.98				
Classification of Cost Items:	Men	Hr.	Rate	Amt.	Cost*	Men	Hr.	Rate	Amt.	Cost*	Men	Hr.	Rate	Amt.	Cost*	Men	Hr.	Rate	Amt.	Cost*
Direct Labor:																				
Mining	40		.36	177.12	.3600	54		.36	237.60	.3600	70		.36	306.72	.3600	88		.36	384.48	.3600
Haulage, Main Line	2	8	.45	7.20	.0146	3	8	.45	10.80	.0163	3	8	.45	10.80	.0127	3	10	.45	13.50	.0127
Gathering	6	8	.45	21.60	.0440	8	8	.45	28.80	.0436	10	8	.45	36.00	.0423	12	8	.45	43.20	.0405
Dumping and Weighing	1	5	.55	2.75		1	7	.55	3.85		1	8	.55	4.40		1	8	.55	4.40	
Tipple, Car Droppers	3	5	.38	5.70		3	7	.38	7.98		3	8	.38	9.12		4	8	.38	12.16	
Other Tipplemen	2	5	.30	3.00	.0232	3	7	.30	6.30	.0274	4	8	.30	9.60	.0270	6	8	.30	14.40	.0262
Total Direct Labor	54			217.37	.4418	72			295.33	.4473	91			376.64	.4420	114			472.14	.4394
Indirect Labor:																				
Drainage	1		130.00	6.50		1		130.00	6.50		1		130.00	6.50		1		130.00	6.50	
Ventilation											1	8	.45	3.60		1	8	.45	3.60	
Trackwork	2	8	.45	7.20		2	8	.45	7.20		2	8	.45	7.20		3	8	.45	10.80	
Timbering	1	8	.45	3.60		1	8	.45	3.60		1	8	.45	3.60		2	8	.45	7.20	
Wiring						1	8	.45	3.60		1	8	.45	3.60		1	8	.45	3.60	
Car Repairing	1	8	.45	3.60		1	8	.45	3.60		1	8	.45	3.60		1	8	.45	3.60	
Sub Total				20.90	.0425				24.50	.0371				28.10	.0330				35.30	.0330
Deadwork				19.86	.0403				19.86	.0301				19.86	.0233				19.86	.0186
Stable and Teaming	1		125.00	6.25	.0127	1		125.00	6.25	.0095	1		125.00	6.25	.0073	1		125.00	6.25	.0059
Blacksmith	1	9	.60	5.40	.0110	1	9	.60	5.40	.0082	1	9	.60	5.40	.0063	1	10	.60	6.00	.0056
Lampman	1	4	.40	*2.24		1	4	.40	*2.24		1	4	.40	*2.24		1	8	.40	*4.48	
Sundry Indirect Labor	1	8	.40	*4.48	.0137	1	8	.40	*4.48	.0102	1	8	.40	*4.48	.0079	1	8	.40	3.20	.0030
Total Indirect Labor	*8			59.13	.1201	*9			62.73	.0950	*10			66.33	.0778	13			75.09	.0703
* Note: Lampman figured 12 hr. on 7-day basis; 4 hr. charged to lamps, 8 hr. to sundry.																				
Total	62			276.50	.5619	81			358.06	.5423	101			442.97	.5198	127			547.23	.5097
Administration and Supervision:																				
Mine Office	2		525.00	26.25		2		525.00	26.25		2		525.00	26.25		2		525.00	26.25	
Mine Foreman	1		225.00	11.25		1		225.00	11.25		1		225.00	11.25		1		225.00	11.25	
Chief Electrician	1		225.00	11.25	.0991	1		225.00	11.25	.0739	1		225.00	11.25	.0572	1		225.00	11.25	.0456
Section and Fire bosses	2	9	.65	11.70	.0237	2	9	.65	11.70	.0177	2	9	.65	11.70	.0137	2	10	.65	13.00	.0122
Night Electrician											1		165.00	8.25	.0097	1		165.00	8.25	.0077
Total Adm. and Supervision	6			60.45	.1228	6			60.45	.0916	7			68.70	.0806	7			70.00	0655
Total	68			336.95	.6847	87			418.51	.6339	108			511.67	.6004	134			617.23	.5752
Compensation				16.17	.0329				20.09	.0304				24.56	.0288				29.63	.0277
Power and Supplies				66.42	.1350				89.10	.1350				110.00	.1300				133.50	1250
General Expense																				
General Office and Sales				110.75	.2251				110.75	.1678				110.75	.1299				110.75	.1037
Grand Total				530.29	1.0778				638.45	.9673				756.98	.8883				891.11	8343
Deductions:																				
Blacksmith				1.23					1.65					2.13					2.67	
Lampman	55		.075	4.13		73		.075	5.47		95		.075	7.12		115		.075	8.62	
Store Scrip				5.07					6.38					7.87					9.58	
Total Deductions				10.43	.0212				13.50	.0205				17.12	.0201				20.87	.0196
Net Operating Costs				519.86	1.0566				624.95	.9469				739.86	.8683				870.24	.8148
Interest, Bonds and Mortgages				88.10	.1791				88.10	.1335				88.10	.1034				88.10	0825
Total Gross Cost				607.96	1.2357				713.05	1.0804				827.96	.9717				958.34	8973
Monthly Cash Outlay					12159.20					14261.00					16559.20					19166.80

*The costs shown are those secured after a wage reduction had been made but the original procedure was developed on this same form, the only difference being in the rates, amounts and costs under each of the base tonnage columns.

at work next, as more tonnage may be required?" When No. 18 Left Heading was decided upon, it was analyzed, as were the original sections, as to the number of working places it provided, the number of men and cars required, and the tons to be produced. The haulage and auxiliary services were then developed as before and, strange as it may seem, considerable difficulty was encountered in keeping the personnel within such limits as would permit the maintenance of unit costs within the limits of the classifications established on the lower tonnage.

During the discussions surrounding the necessary readjustment of the views of the operating department as to the personnel required, they discovered the fact that in this tool of management which was being forged for them was a measuring stick by means of which it would be possible for them to evaluate any job and, further, that if they did not so evaluate the jobs under their control, the executives would be able to and would do this. For the first time, apparently, they realized that the addition of a man to the payroll could not be justified by the mere fact that more tonnage would be obtained.

Answers to additional questions would be required and demanded. How much additional tonnage is obtained? Is additional tonnage demanded and if so can it not be obtained without additional outlay? What was the cost per ton in the cost classification in which the addition is to be made, and what will it be after the addition is made? In other words, it was now vitally important to know that the total unit cost or cost per ton of the classification in which the man was to be placed would not be increased. This same conception was readily transferable to the proper evaluation of every item of expense. These discussions developed in the minds of all of the control men in the organization the fact that in dealing with any item of variable costs—i.e., those costs whose total increased with increasing production—the unit base cost of any classification as it had been established in the basic fixed costs must never be exceeded and, wherever possible, it should be reduced.

The same routine as has just been described was followed in completing the detail on the "Standard Unit Cost Sheet" to and including "Operating Administration and Supervision." At this point, it was found that a saving of 5.24c. per ton had already been effected on a production of 20,000

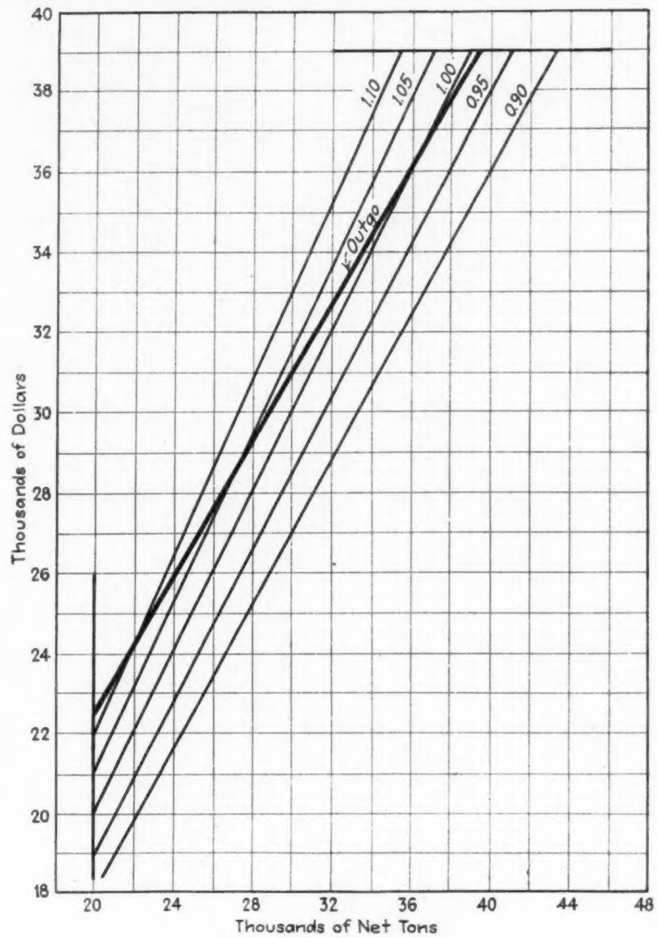

Fig. 1—Profit Points Established Before Use of Budgeted Costs

tons per month. The monthly outgo as it was computed at this point of the budget development is charted in curve 1 of Fig. 2.

The operating department was then instructed to survey the power situation and to prepare a budget of supplies. The report submitted on power recommended some slight outlays for bonding, wiring, and some minor replacements and also suggested an adjustment of working time so that some of the peak loads could be reduced. These suggestions were carried out and the resultant saving in power, together with a better turnover and use of supplies, showed a reduction of 1c. per ton on the 20,000-ton base.

While this work was going forward, consideration was being given to the budgeting of "General Office" and "Sales Salaries and Expense." The acceptance of the viewpoint that increased sales were not the major objective but that rather the vital urge was for lower unit costs on existing tonnage made it possible to bring the consideration of these items into proper perspective. Previously, it had been thought necessary to move from 25 to 30 cars per day and to make every effort to do this on at least 280 days per year. This had been the sales objective — never reached, it is true, but, nevertheless, earnestly striven for. Now, if the required tonnage of shipments could be taken care of with the movement of from 20 to 24 cars per day on not to exceed 200 days per year, obviously the sales department was overmanned. The result of this analysis of the situation was the closing of an Eastern sales office and the wiping out of two field jobs, with a saving of 33 per cent in this item of outlay.

Curve 2 of Fig. 2 shows the outgo after the entire organization had been budgeted and indicates that without any reduction in wages or salaries a saving of from 10 to 12c. per ton had been effected within the range 20,000 to 22,000 tons.

While the work was being carried to this point, the market still had been declining and while the results obtained by budgetary control showed that the costs could be brought to the desired point without the reduction of wages, it was decided that the factor of safety was too small in view of the market trend and a budget was re-

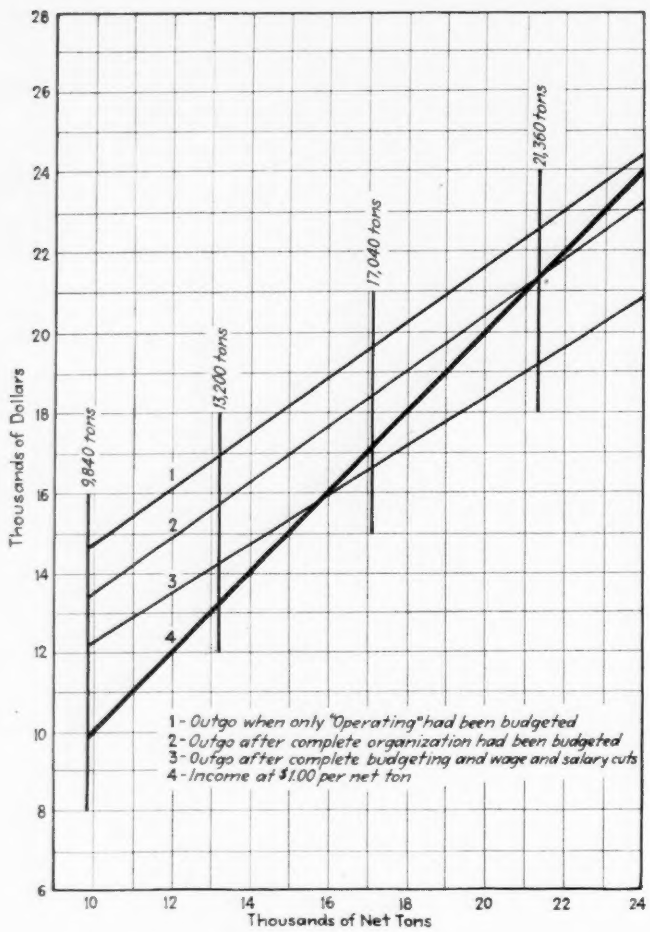

Fig. 2—Profit Points During Budget Development

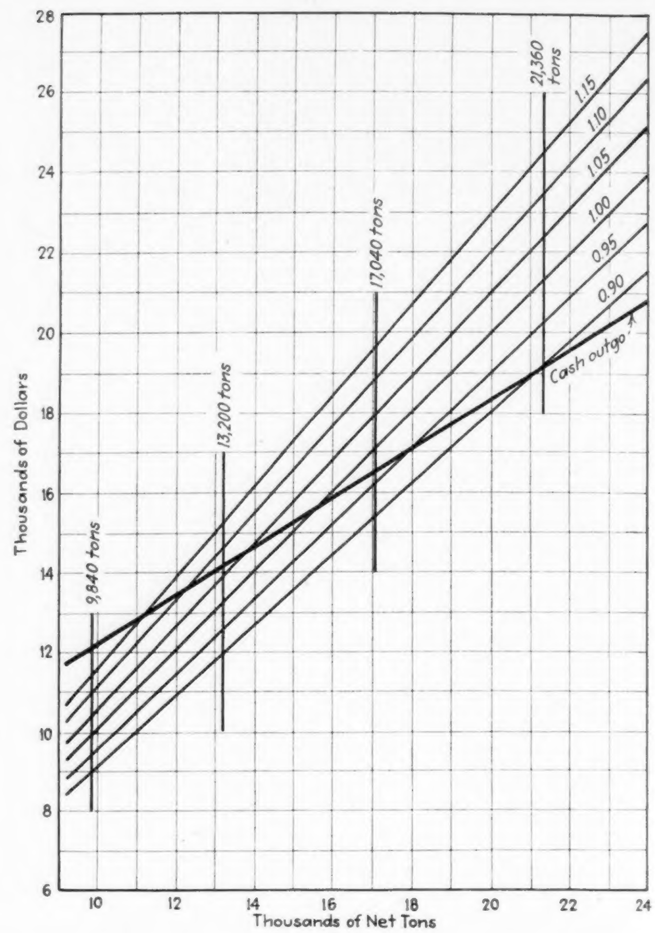

Fig. 3—Profit Points on Budgeted Costs at Various Sales Prices

drawn with wages in line with those of the district and with a cut in salaries of 10 per cent. The costs obtained on this basis are those shown on the "Standard Unit Cost Sheet" (Table I) and Curve 3, Fig. 2, represents the outgo on the new budget. In Fig. 3, this same outgo is plotted across the income curves for tonnages of from 9,500 to 24,000 at values per net ton through the range from $0.90 to $1.15. For comparison, Fig. 1 is given, showing the outgo curve as computed by the company's auditors from the company records and past experiences before the application of budgeted costs.

As previously stated, the mine had been paying a wage rate for all classifications of labor higher than any of its neighbors and the management hesitated to abandon its position in this matter. However, the number of days worked per pay had been few and working time had been irregular. It was evident that the total number of employees carried on the payroll would be materially reduced, but it seemed possible to give the smaller number of employees regular employment by operating the mine regularly for but four days per week and that on this basis the actual total wages of each employee would be increased even if the necessary wage cut was made.

The management felt that it now had facts which would enable it to make an optional proposal to the employees: either to close the mine down and await a more favorable market or to operate on the curtailed production four days per week with reduced wages and salaries. Although the operation was open-shop, the management asked the employees to appoint a committee to meet with the officers to discuss the situation. This was done, a two-day shutdown was ordered and in two meetings the plan was adopted that the operation was to carry on under budgeted costs with a voluntary reduction of wages and salaries. The facts disclosed by the budget survey were freely used in these meetings and the employees met the management at least half way and brought out points which had been overlooked in the preliminary work.

Enough orders were on file to carry the operation on the reduced schedule for three weeks and during this period the management was successful in contracting sufficient additional tonnage to guarantee production of slightly more than 20,000 tons per month at a net sales realization of slightly more than 93c. per ton.

For the purpose of testing the budgeted costs, when operations were resumed the start was made on the basis of 500 tons per day and each of the tonnage classifications as shown on the "Standard Unit Cost Sheet" was used as the basis of operation for the period of one week of five working days. But few minor changes were found to be necessary and the total unit cost was not changed. This procedure demonstrated the accuracy of the work and removed the whole program from the category of experiment. As the successful results of this test became known, the entire organization was encouraged and stimulated and the standard costs as established have been met successfully by the entire organization during the time since their adoption.

The results obtained may be briefly summarized. Previously, the management had felt that it could not operate without a loss within the capacity of the mine—that is, 30,000 tons monthly—on a sales realization of less than $1.04. The condition of the market made it impossible to obtain either that tonnage or that price. The one certainty in the current mar-

ket was a loss which would be dependent upon the tonnage and price obtained. To increase tonnage or better the price increased sales effort and expense must be supported which created another variable in the loss to be expected. Production and running time were irregular, labor turnover was high, the employees were dissatisfied, in spite of the higher wage scale, and the entire organization was nervous, uncertain, and "touchy."

After the adoption of budgeted costs, the management found that it was possible to maintain the profit point on the amount of tonnage available at the current market price. Instead of the one certainty being a loss of unknown proportions, there were several much more desirable certainties. A profit—small, it is true—was assured, labor conditions were greatly improved, tension in the organization was removed, and the company was in a position to maintain itself in the market for an indefinite period and would be ready to meet changing conditions as they developed.

Some of the circumstances set out in the foregoing application of budgeted costs have been somewhat disguised, but the figures used have been taken from an actual case and are not theoretical, even to the fourth decimal place. The cost figures derived by the old method of accounting were average and normal in comparison with those of other operations in the same field and were not abnormally high, as might be supposed when the saving obtained is considered.

In the foregoing, an attempt has been made to place before the coal industry a tool for self-help. As stated previously, the improvement of conditions lies within the will of the management of the industry. The plan here presented need not be supported by association effort but may be used by the individual operator with extremely beneficial results both to himself and to the industry. Spasmodic attempts of the industry to organize and attempts of some organizations and individuals to obtain outside assistance, even to intervention by the government, place the industry in the position of the "blind" beggar asking for alms when nothing is the matter with his sight except the dark glasses which he has placed before his own eyes.

Prices cannot be maintained by associations. Producers of oil, copper, rubber, and coffee have tried it unsuccessfully. Price, after all, is not the goal of business, but profit is. Profit is the measure of service. Service does not consist in offering a commodity for which society has no need. The bituminous industry insists on offering to the consumer 250,000,000 tons of coal which the consumer cannot burn.

The industry cannot maintain itself merely for the sake of production. It can maintain itself only by producing with reference to the demand of the market. Tonnage in the industry is not a sign of strength or of fitness, but only of obesity. This excess weight must be reduced; sickness of the industry is doing it now, but exercise, especially the exercise of common sense, will help.

The entire industry must become a firm believer in the theory of GREATER PROFITS AT LESS VOLUME.

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Storage Batteries in Illinois Mines

(Continued from page 356)

findings can be reported to the operating force for correction.

At this mine, batteries in the best of condition were applied to the heaviest service in the hauling of coal. As they lost capacity, they were assigned to easier and easier hauls and finally wound up in utility service. This practice accounts in part for the long life derived from the batteries—as much as 25 per cent over that guaranteed. Only two extra batteries were kept on hand. These were used chiefly for night service and for extra duty during the day shift. All batteries used were of the lead-acid type, 48 cells each, with the following number of plates: 39, 37, 33, or 27.

If supplies must be delivered when the power is off, as in the distribution of powder, a battery locomotive will make important savings, because it enables two men to do as much as eight or ten men with mules, especially if two men are necessary for unloading. The locomotive battery can be used also to furnish power for pumping or other duties which must be attended to during this same period.

Commenting on the application of storage batteries to the No. 12 mine specifically and to gathering locomotives in mine service generally, W. H. Russell, master electrician of the Madison Coal Corporation, made the following points:

"The use of trolley gathering locomotives would add about $700 per month to the demand charge by increasing the 5-min. maximum demand from 750 to 1,150 kw. for 5,200 tons daily, and with little change in power consumption, assuming the line loss approximately equal to the battery loss, although usually it is more. Substation and transmission line or boiler and generator facilities also would have to be increased.

"As storage-battery locomotives are spplied a constant voltage, electrical maintenance is unquestionably less than with locomotives of the cable-reel type. No. 12 mine has not averaged two gathering-locomotive armature rewinding jobs a year during the last four years. This comparative freedom from electrical troubles reflects larger savings from avoidance of operating delays.

"Aside from the electrical improvements in the batteries and motors, substantial progress is being made in the transfer of mechanical power to the wheels. Transmissions in the earlier storage-battery locomotives were open and exposed to dust and dirt, which caused undue wear. Plain bearings developed a high degree of friction. Furthermore, the construction was such that moving parts lost efficiency through play.

"Modern design totally incloses the drive mechanism. Gears, axle, and motor are put in one rigid frame, an arrangement which keeps these parts in line and reduces friction and wear. Heavy-duty ball bearings contribute their share to the improvement."

WESTERNERS SURVEY

+Technical and Economic Problems In Rocky Mountain States

NO MAJOR PHASE of the technical and economic problems of the coal-mining industry in the Far West escaped consideration at the thirtieth regular meeting of the Rocky Mountain Coal Mining Institute, held at the Cosmopolitan Hotel, Denver, Colo., June 3-5. Even the delicate topic of labor relations was touched upon when Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Neb., in the course of a discussion of accident prevention, remarked that he thought "what the coal industry wants is a liquidation of its incompetents more than a liquidation of its wages, and that applies to management as well as men."

In presenting the case of the stoker, James A. Thorsen, general sales manager, Combustioneer, Inc., Cleveland, Ohio, said that "the small stoker field" is not synonymous with the "domestic" or household field. On the contrary, the greatest penetration in the next few years will be in the smaller industrial plants, greenhouses, laundries, ice plants, dairies, garages, apartment houses, hotels, theaters, schools, churches, and other public buildings. A "real" domestic stoker, he asserted, has not yet been put upon the market; nevertheless, he urged installation of types now available, because of their great superiority over hand-firing equipment.

"The success or failure of the coal industry to maintain its position as the main source of fuel for the nation depends upon the measure of our success in furnishing the now desired, satisfactory, automatic heat and power with coal." The drive against air pollution is helping the stoker. Stokers, however, must be properly installed and have proper fuel to give the most efficient service. "Any old fuel" may be burned, but it is not wise to follow such a plan. Most small stokers give best results with 1¼- to 2-in. screenings. For household or domestic installations, he recommended screened pea or No. 4 nut.

Can Coal Improve Safety Record?

SHARP CRITICISM of the safety record of the bituminous coal industry marked the discussions at the first technical session of the institute on the afternoon of June 3. Protective clothing—goggles, hard-toed shoes, and hard-boiled hats—had been effective in reducing accidents, it was pointed out by several speakers, but there is still a great need for more hard-boiled management to instill effectively and enforce discipline which will reduce the toll of life, limb, and lost time.

Reviewing the cost of accidents to coal mining, C. A. Herbert, supervising engineer, U. S. Bureau of Mines Safety Station, Vincennes, Ind., told his audience that:

1. Measured in terms of man-hours of exposure, there has been no reduction in coal-mine accidents in the United States during the past twenty years. Other industries, almost without exception, have shown material reductions during the same period.

2. Accidents can be reduced without the expenditure of large sums of money.

3. Experience has demonstrated that the safe plant is the efficient plant and the efficient plant the safe one.

4. For every fatal accident, it has been estimated, there are 104 accidents of all classes—fatal and non-fatal, compensable and non-compensable.

5. The direct cost of accidents (compensation and medical attendance) in bituminous mines last year approximated $20,000,000, or $137 per accident. Indirect or hidden costs probably lay somewhere between $40,000,000 and $80,000,000 and the cost in wages lost by the injured approximated another $40,000,000. Direct costs, therefore, averaged 4½c. per ton mined; indirect costs, between 9 and 18c.; and the total cost, using the minimum estimate on indirect costs, approximately 22c. per ton.

6. Direct costs to the operator have nearly doubled during the past six years. Continued changes in state compensation laws indicate a very definite tendency toward shifting the entire cost to the shoulders of the operators.

7. If accidents are to be reduced, management must recognize safety as a major operating problem and hold the supervisory force as strictly accountable for accidents as it does for tonnage, cost of production, and quality of product.

8. All accidents should be investigated to determine the underlying causes and to place responsibility.

9. Under such a program, management has the right to expect a saving of at least 10c. per ton through reduction in accidents and as much or more through increased efficiency due to good foremanship.

A. C. Watts, assistant to the president, Standard Coal Co., Salt Lake City, Utah, in a paper on the same subject, called particular attention to the danger of skimping on labor and material in times of depression. He also emphasized the importance of taking mine ratings into account in fixing compensation insurance rates. These ratings reward the safe operator and penalize the unsafe.

"Safety Work Pays" was the conclusion of Robert Williams, Jr., superintendent, Calumet Fuel Co., Somerset, Colo., in a paper read in his absence by Lyman Fearn, chief coal mine inspector for Wyoming. About eighteen months ago the Utah and Calumet Fuel companies launched an extensive drive to reduce lost-time accidents. The first step was the introduction of hard-boiled hats. Next, the use of goggles was made compulsory in picking or breaking coal, rockwork, or any other labor where there was danger of flying splinters. Hard-toed shoes followed. "Our mine is now 100 per cent on hard-boiled caps, goggles, and safety shoes." First-aid training, although not made compulsory, was taken by every employee. Individual first-aid kits were distributed among the workers. A small charge is made for the kit when issued, but there is no charge for refills;

the money paid for the kit is refunded when the box is returned if an employee leaves. Rock-dusting is carried to within 15 or 20 ft. of the working place and water lines are laid to all working places.

Since the introduction of protective clothing and goggles, head injuries have approached "the vanishing point" and eye injuries are "practically unknown," asserted Mr. Williams. Because of the high temperature in the mine, some difficulty was experienced at the start in enforcing the wearing of goggles, but this was overcome by establishing a rule that any man discovered without goggles at work where they should be worn would be laid off one week for the first offense and discharged for the second.

Timbering in the rooms is kept up to the faces, with a minimum of 5 ft. between timbers. In normal working places on the right side of track, props or legs of crossbars are set 3 ft. from the rail and this space is kept clear.

James Dalrymple, chief inspector of coal mines for Colorado, argued for less clearance between the rib and the rail and suggested 12 to 14 in. He argued that there should be more timber placed at the road head because men in the roadway may, under the 5-ft. agreement, work in an unsupported space 8 to 10 ft. wide. "It does not seem reasonable to ask a man to timber a certain place every 5 ft. where he does 5 or 10 per cent of his work and let him work in an untimbered space twice as wide where 90 per cent of his work has to be done" —especially when 80 per cent of all the Colorado accidents from falls in 1929 were at the road head. With the clearance cut down in 1930, road-head accidents were reduced over 15 per cent.

At the Boncarbo mines of the American Smelting & Refining Co., where the roof is bad and has pots several feet in diameter and 20 to 30 ft. thick, said C. R. Garrett, superintendent, it is necessary to carry crossbars in entries and in rooms on 3-ft. centers, and a roadway prop with a substantial cap-piece, set as nearly as possible at right angles to the slips in the roof, 3 to 3½ ft. ahead of the advance timber. As soon as the face is cleaned up to that point, crossbars are placed. The roadway prop is advanced as the cleaning of the face advances.

"Producing Coal Safety" was the subject of a paper by Thomas G. Fear, general manager of operations, Consolidation Coal Co. In the absence of the author, the paper was read by D. J. Parker, U. S. Bureau of Mines, Salt Lake City. The address was based upon the experiences and rules formulated by the Consolidation Coal Co. (see *Coal Age*, Vol. 35, p. 604) and treated in detail the organization and functions of the Consolidation "safety courts."

Mr. Fear urged that operators institute responsibility ratings on all personal injury cases to determine unsafe employees and officials. In the case of Consolidation, these ratings are fixed by a committee made up of the division manager, division superintendent of mining, division superintendent of maintenance, division engineer, division mine inspectors, and the chief gas inspector. Accidents are classified as due to (1) substandard conditions — i. e., injuries caused by natural or mechanical conditions existing in violation of the mining law or company standards; (2) violation of rules or regulations; (3) lack of, or poor, supervision; (4) carelessness, lack of intelligence or education; and (5) unavoidable—i. e., accidents which no precautions could have prevented. Accidents in class 5 should not exceed 5 to 8 per cent of the total of today's so-called accidents.

As the result of a four-year campaign, the tonnage per fatality at Consolidation has risen from 258,000 to 682,000 tons and the number of fatal accidents decreased from 46 in 1926 to 15 in 1930. Compensation costs per ton in the same period have declined from 4 to 2c. per ton, and 1c. is the goal for 1932. Compensation payments in 1930 were $217,000 less than in 1927.

In discussion, Eugene McAuliffe, president, Union Pacific Coal Co., asserted that the operations he represented were perhaps among "the most over-experted, over-examined, and over-inspected in the world," but the safety problem had not been licked, despite the expenditure of hundreds of thousands of dollars. The industry, both management and men, still takes accidents too lightly. "We have not established a proper attitude of mind. I believe that will come only out of discipline."

Discussing the charge that the failure of the industry to make greater progress in accident reduction was due to the increased use of machinery and electrical power, Mr. McAuliffe asserted that in eight years he could recall only one serious accident from electricity at the Union Pacific mines and that one, due to carelessness, occurred outside. These mines use 2,200 volts. "I question whether there is any more danger in 2,200 volts than there is in 250 volts, because every man knows that a 2,200-volt current is dangerous and he is going to watch it."

A two-year study of the relative hazards of hand and mechanical loading based on man-hours of exposure, he continued, indicates that the men attached to the mechanical-loading process enjoyed about 44 per cent more man-shifts per compensable accident than those directly engaged in hand loading. In arriving at these figures every accident to a man directly or indirectly engaged in mechanical loading is charged to the mechanical processes.

Reiterating the opinion that management in general is "not vitally concerned with safety problems," he added, "one thing has come to my attention very forcibly: the greatest improvement in accident reductions that has been made recently has been made in non-union territory."

Modern Aids for Modern Mining

MODERN AIDS for modern mining, such as high-capacity mine cars, up-to-date tipples, electric welding, and storage-battery haulage loomed large on the program of the institute sessions June 4. The idea that haulage costs ought to be subjected to searching analysis by operating men to effect economies and increase efficiencies comparable with those already attained in underground mechanization and mechanical preparation was advanced by Houston H. Watt, vice-president in charge of sales, Watt Car & Wheel Co., Barnesville, Ohio.

Equipment has replaced man-power for screening and cleaning in modern tipples, asserted J. W. Wilson, engineer, Link-Belt Co., Chicago. "With the electrical controls in the hands of a few men, immense tonnages are loaded today where yesterday many men were used to load small tonnages."

How electric welding plays its part in reducing costs in coal-mine operation was outlined by G. N. Robinson, engineer attached to the Denver office of the General Electric Co. The place of storage-battery haulage in modern mining was described by John Rosholt, manager of the Denver office of the Electric Storage Battery Co., who drew upon government reports to drive home his argument that the storage-battery locomotive could meet trolley and cable-reel haulage on the basis of cost and was far ahead of the last two types in safety.

Mr. Watt, whose paper was read in his absence by Benedict Shubart, secretary-treasurer of the institute, described the various types of trucks from that of the lowest-priced car with plain bearings for slow speeds and short hauls to cars equipped with tapered roller bearings which "remain constantly to gage for long periods of time" if properly lubricated. "Experimental, revolutionary ball-bearing trucks," he added, "are now being severely tested in service. Ball bearings may be installed upon rotating or non-rotating axles and will solve the problem of radial and thrust loads without adjustment of bearings. It is deemed possible to provide suitable ball-bearing trucks, sealed for life, so that lubrication will never be required."

How capacity has been progressively increased by modern car design without changing over-all dimensions was illustrated by a series of slides beginning with the single-flare, wedge-shaped car of all-wood construction (Fig. 1) and ending with an all-steel car having a drop axle and with the body bolted to the truck in oblong holes (Fig. 2). The older type car shown had a capacity of 94 cu.ft.; the later type 147 cu.ft.

In one case, Mr. Watt pointed out,

an operator replaced an older type with a more modern design, but made no change in capacity. As a result, the newer car was $7\frac{1}{2}$ in. lower than the old one; this enabled the loaders to shovel more coal with the same expenditure of energy and reduced costs approximately 10c. per ton. In a second case, where a shaft operator with a maximum hoist capacity of 1,100 hoists daily replaced the single-flare type for a more modern design, the load per car was increased 1,200 lb. without increasing the over-all dimensions—or the equivalent of 660 tons additional daily output without increase in haulage costs.

Tipple design and construction, stated the Wilson paper, read in the author's absence by C. M. Schloss, Lindrooth, Shubart & Co., Denver, Colo., must take into account the manner in which the coal from the face is delivered to the preparation plant. The preparation plant usually begins with the main shaker screens for screening out the plus 2-in. coal. If these are the inclined-gravity type on a 12- to 14-deg. pitch, a speed of about 100 r.p.m. is required.

Sizes under 2 in. can be cleaned best mechanically, said the author, advocating wet washing as "the simplest and most effective way known." Mr. Wilson's paper outlined the principle upon which the Simon-Carves system operates. This system has been treated several times in previous issues of *Coal Age* (see Vol. 26, pp. 177-180; Vol. 34, pp. 220-222; Vol. 35, pp. 707-710).

"Coal tipples range in cost from $150 to $400 per ton per hour of mine-run capacity when steel structures are used; with complete washeries added, the cost may run from $500 per ton per hour and up." Local topography, the manner in which the coal is handled, the character of the coal itself, and the cleaning job required all play a part in fixing these costs.

Northern Colorado operators, stated Harry Jones, chief engineer, Rocky Mountain Fuel Co., Denver, Colo., in reply to a question from Institute President G. A. Kaseman, have been compelled to make provision for delivery at the tipples to trucks to meet growing customer demand.

To eliminate railroad complaints that tramp iron gets into the coal and seriously affects locomotive operation, the Union Pacific Coal Co., said President McAuliffe, is planning to install magnetic separators at all its tipples. Mr. Kaseman remarked that he, too, was considering such a step.

The vanishing scrap heap, declared Mr. Robinson, is a tribute to electric arc welding. To consider welding equipment only as a useful "first-aid" tool for temporary repairs is to ignore real opportunities for efficiency and economy. "How to make modern electric arc-welding equipment yield the maximum is largely dependent upon the resourcefulness of the master mechanic and the welding operator." This equipment, he asserted, can be regarded as "additional insurance protection" for maintaining production and can make possible reductions in store-house inventories of repair and renewal parts. In one case, he said, the "insurance" of electric arc-welding equipment led to a reduction of approximately 50 per cent in inventories.

Mr. Robinson cautioned coal men against expecting to make major repairs and new construction or fabrication jobs successfully and economically with the resistance type of equipment, which is intended primarily for welding rail bonds. "Suppose," he said, "a job to be performed requires 150 amp. at 20 volts—that is 3 kw. The resistor is connected to the 250-volt power circuit and draws from that circuit 150 amp. at 250 volts—that is $37\frac{1}{2}$ kw. Here we have $37\frac{1}{2}$ kw. input to obtain 3 kw. output of useful energy, or an efficiency of only 8 per cent." With a modern motor-generator set having a generator designed for electric welding, input to develop 3 kw. of useful energy would be only 6.6 kw.

The greatest difficulty experienced in the use of electric welding, remarked Frank B. Thomas, electrical engineer, Victor-American Fuel Co., Denver, has been the selection and training of operatives. Use of portable welders at the Superior mines of the Union Pacific Coal Co., said M. A. Hanson, has eliminated at least two machinists, a blacksmith and a helper; work is done on the shift beginning at midnight.

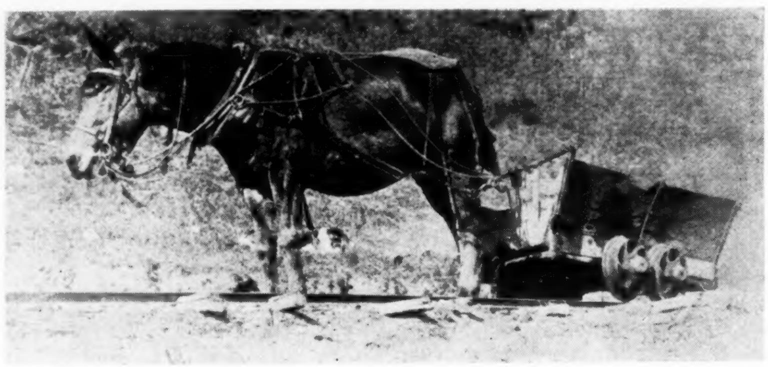
In presenting the merits of the storage-battery locomotive, Mr. Rosho't cited the U. S. Bureau of Mines R. No. 3051, November, 1930, entitled "Hauling Coal Safely With Permissible Storage-Battery Locomotives," by C. W. Owings, which stated that "coal may be and has been cut, gathered, and hauled safely at approximately the same cost with permissible storage-battery locomotives as with trolley, cable-reel, crab-reel, or non-permissible storage-battery locomotives."

Data collected during a comprehensive study of storage battery and wired transmission of power in certain Pennsylvania and West Virginia mines "indicate that there is but little difference between the cost of hauling with cable-reel and with storage-battery locomotives." Studies reported in Bulletin 42 of the Carnegie Institute of Technology show costs of 23.13c. and 24.44c. for two trolley mines and 22.82c. and 24.14c. for two storage-battery mines.

Though no completely foolproof piece of mine equipment has ever been designed, permissible storage-battery locomotives are conceded to have a much higher factor of safety than their rival types. "Operation of mines with storage-battery power is not claimed to be entirely safe under all conditions, such as mistreatment of equipment and use of non-permissible units. But, if equal attention is given to trolley equipment and to permissible storage-battery equipment, the latter is much safer, and at little, if any, extra cost, especially if trolley wires are adequately guarded and if cables are connected through permissible junction boxes."

Storage-battery locomotives at the Utah Fuel Co., said E. J. Muth, Electric Storage Battery Co., operate for a distance as short as 7 ft. on a 17 per cent gradient. Fairly long grades as high as 4 per cent are negotiated, "but, of course, under conditions of that kind, the battery becomes exhausted much more quickly than it does on a fairly level run."

Fig. 1 (Top)—Old Single-Flare Mine Car
Fig. 2 (Bottom)—Car of Same Over-All Dimensions, but Modern in Design, Having 56 Per Cent Greater Capacity



Mechanical Mining in the West

THREE PHASES of mechanical mining in the Rocky Mountain region were presented in formal papers at the institute sessions on June 4 and 5. The experiences of the Vickers Coal Co. with shaking conveyors, duckbills, and pit-car loaders in southern Colorado were described by I. M. Charles, general superintendent, Temple Fuel Co., Trinidad, Colo. A joint paper by C. E. Swann, chief engineer; Thomas Foster, superintendent, Union Pacific Coal Co.; and W. D. Bryson, superintendent, Colony Coal Co., covered the use of shaking conveyors equipped with duckbills in driving rock tunnels. Gilbert C. Davis, manager, Stag Canon branch, Phelps Dodge Corporation, told of scraper loading at Dawson, N. M.

At the Kenneth mine, said Mr. Charles, Flottman standard shaker-conveyor pans with Vulcan Iron Works', 25-hp. enclosed drive were installed in rooms driven directly up the pitch. Cars are handled in trips past the loading points by portable hoists equipped with solenoid brakes and remote control.

"Top conditions in these rooms," continued Mr. Charles, "varied from fair to good, but the duckbill was used effectively. The coal thickness averaged about 3½ ft.; and the coal loaded per man shift, about 10 tons. Some difficulty was met in the removal of pillars, the face frequently falling along the line of the stumps, but when the top broke satisfactorily, the men produced more coal per shift from the pillars than when on the advance.

"This spring the conveyors were put to work driving conveyor entries. A shaker is set in each of a pair of entries and coal from one carried through a crosscut by means of a short Jeffrey chain conveyor, or through a slant by using a swivel in the pan line to the other entry, where the coal from both entries is loaded in pit cars at a common loading point.

A cutting machine and drilling outfit is kept at the face of each place which is to be loaded out with conveyors. This means a greater investment in cutting machines than under the hand-loading system, where machines are moved from place to place. Much work is now being double-shifted. Coal is cut with Sullivan CE-7 and Morgan-Gardner machines with 6-ft., cutter bars. The coal is drilled with Chicago Pneumatic No. 472 drills, mounted on the cutting machine, but readily removable so as not to be in the way while cutting. Drills, cutters, and conveyors use 440-volt alternating current. The coal is shot with Cardox.

At present the work is done on a contract basis. Seven men, one at the loading point and two crews of three at the face, contract jointly as a group and load in a pair of entries, averaging about 85 tons per shift. After entries have been advanced 250 to 300 ft., the conveyors are moved ahead and a new loading point is established; this work is done by day labor. "Entries have been advanced more than 150 ft. a week." The output at present, from narrow work only, including time spent in moving conveyors, is about 10 tons per man shift, which is considerably in excess of that produced in hand loading."

R. J. Meyer, Denver, was asked to describe his new equipment for breaking coal hydraulically. The apparatus consists of a hand pump connected by tubing to a special rubber tube which is inserted into the coal after a hole has been drilled and the coal undercut. Steel locks at each end prevent end expansion when the water is forced into the tube. Pressures from 350 to 2,500 lb. per sq.in. can be developed, he said, although the maximum so far used in experimental work in Colorado mines has been 1,650 lb.

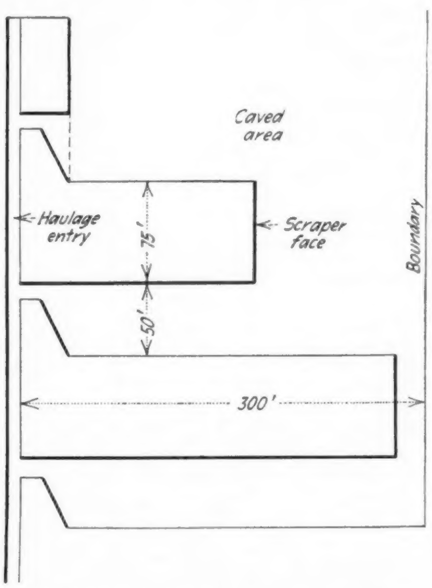


Fig. 3—An Early Method of Working Scraper Loaders at Dawson

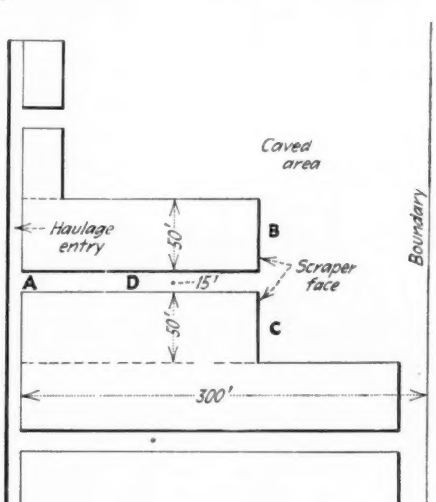


Fig. 4—Present Scraper Loader System at Dawson

At Winton, remarked Mr. Foster, a somewhat different system of working scraper loaders is employed. Rooms are driven 12 to 14 ft. wide and 300 ft. long, and the coal is scooped or slabbed and loaded with big scrapers. A crew of twelve to fourteen men has loaded as much as 500 tons.

By way of preface to his discussion of mechanical loading, Mr. Davis remarked that there were many conditions at the Dawson coal mines which were unfavorable to machine mining but which could not be changed even to render feasible the operation of mechanical equipment. Among these were the necessity for obtaining clean coal, the difficulties in supporting the roof, and the restrictions as to shooting.

Certain mechanical devices could have been used successfully had the crews been able to shoot at will, but unfortunately all the shooting has to be done with all workmen out of the mine, including even the man who fires the shots. This is due to the quantity of gas and the extremely explosive dust. Consequently, at the Dawson mines it has been necessary not only to select such mechanical equipment as is usable in any particular mine or under any specific condition but also to hark back to the room-and-pillar system, modifying it in a manner favorable to the type of machine that can be installed.

At Dawson the top is very bad. In a few isolated places there is a fairly good sandstone roof, but that is so rare an occurrence that it is hardly worthy of consideration and should have no bearing on the discussion. The top is a rather slick drawslate of variable thickness, with many so-called pots that drop out without warning.

Experiments have been made at different times into many mechanical means of loading coal—among them long-face mining with shaking conveyors and scrapers. Today Goodman entry loaders are being used, seven having been installed. These were used at first to drive rooms about 50-ft. wide at such centers that pillars 75 to 100 ft. wide were left between them. The rooms were extended about 300 ft. to the boundary of the territory. When this was reached a cut was driven over and the pillar was removed on the retreat (see Fig. 3). In this work the entry loaders were flitted from place to place.

But with a plan such as this, much time and motion were wasted. Consequently, it was changed to that in use at present (see Fig. 4). Rooms 15 ft. wide on 115-ft. centers were driven to the boundary by hand methods. Then a cutover was made and the coal mined on the retreat. The entry loader is permanently located at *A*. Alternate cuts are made on the half pillars *B* and *C*, each 50 ft. wide and located on opposite sides of the scraper way. Thus the men are kept steadily employed without the necessity of moving from place to place. Coal scraped from these faces through the room *D* is loaded in mine

cars which pass in a string under the loader, being moved either by a locomotive or a car haul.

Face *B* is loaded out during the day and Face *C* is undercut and drilled that same night and then shot with everybody out of the mine. The coal is removed by scrapers to within 25 ft. of the entry.

Scraper operations for the first five months of 1931 netted 14 tons of coal per man-shift. Four men were used on each unit, but consideration is being given to increasing the crew to six men, four men to devote all their time to scraping coal and the other two to undercutting and drilling the coal and setting timber.

Accounting as a Cost-Control Tool

POSSIBILITIES of cooperative development of cost bases and the use of daily records to check and control current operations were outlined at an institute meeting on June 5 by J. A. Bullington, assistant controller, Colorado Fuel & Iron Co., Pueblo, Colo. By setting up budget standards of operation and checking these currently against daily figures, he pointed out, it is much easier to trace out-of-line expenditures and to stop leaks before they grow too large.

In working out such a system, he said, these fundamentals must be kept in mind:

"1. Higher management must feel the need of a better control of costs and be willing to cooperate in installing and operating the system.

"2. A competent cost man who is enough of a salesman to put his ideas over is essential.

"3. Thorough cooperation between general management, mine superintendents, foremen, and cost accountant is necessary in setting up standards of performance and in budgeting operations.

"4. No cost system will run itself; after proper installation, a constant check must be kept and new ideas analyzed and developed into usable methods. Progress is made on the assumption that the usual way of doing anything probably is the wrong way. The fact that an idea or method is old, however, does not necessarily mean that it is not good.

"5. Nothing can be taken for granted: facts, and facts alone, are safe to build plans on."

Analysis of costs at the average mine, said Mr. Bullington, shows that approximately 75 per cent of the costs for which the superintendent is responsible are chargeable to labor, about 13 per cent to supplies, and 5 per cent to power. Management and incidental expenses will average approximately 7 per cent. Therefore, the first big job is the setting up of standards for labor costs covering by occupations the number of men necessary to produce a predetermined tonnage per day and also the number necessary when the mine is idle.

These data are covered in the "Daily Force Report and Labor Cost" records of the company (see Fig. 5). The lower portion of the report makes provision for carrying forward the daily figures on a cumulative basis throughout the month.

The standards set up, Mr. Bullington emphasized, were the result of open conference between the operating department and the accounting forces. Many systems fail, he said, because there has been no mutuality in their installation. During the first six months this system was in use at the C. F. & I. mines "we reduced our labor forces and increased our budget production enough to show a substantial saving to the company in actual operating expense."

Based on figures shown in the daily reports, a monthly cost sheet (see Fig. 6) is made up for the use of the mine superintendents and the general management. This report covers both costs directly controllable by the mine management and costs which are part of the general expense. The monthly report is supplemented by two other forms known as "exhibit sheets" (see Figs. 7 and 8) which analyze the cost figures in still further detail.

A feature of these reports which at-

Fig. 5—Daily Force Report and Labor Cost

Date......................., 193...

Occupation	Standard Idle	Standard Reg.	Act.	Rate	Amount
Tipple Boss and Outside Foreman	1	1			
Weighman Pit Cars		1			
Weighman R.R. Cars		1			
Car Dropper		1			
Box Car Loader Engineer		1			
Tend Nut Car		1			
Dumper		1			
Pusher		1			
Coupler		2			
Trim Cars		1			
Oil Pit Cars		1			
Slate Pickers		3			
Stable Boss	1	1			
Stable Boss Asst.	1	1			
Teamster	1	1			
Electrician		1			
Lampman	1	1			
Machinist and Electrician	1	1			
Machinist	1	1			
Blacksmith		1			
Blacksmith Helper		1			
Blacksmith and Car Repairer		1			
Car Repairer		1			
Car Repairer Helper		1			
Hoist Engineer		1			
Watchman	2	2			
Janitor and Heating Plant	1	1			
Tipple Laborer		1			
Total Outside	10	32			

Occupation	Standard Idle	Standard Reg.	Act.	Rate	Amount
Foreman	1	1			
Asst. Foreman	1	1			
Fire Boss	1	2			
Shotfirers		2			
Driver Boss	1	1			
Drivers (1 or 2 Mules)	4	22			
Drivers Team		4			
Trapper		4			
Timbermen	1	2			
Trackmen	1	4			
Rockmen	1	3			
Bratticeman		1			
Pumpmen	5	5			
Lineman		1			
Hoistmen	1	3			
Rope Riders	1	5			
Rollerman	1	1			
Machine Boss	1	1			
Pipeman		1			
Total Inside	20	64			
Coal Branders		2			
Walsen District Truck Driver	1	1			
Camp Carpenter		1			
Labor Clean Camp					
Pumpman No. 2		1			
All Districts Harness Man		1			
Total Miscellaneous	1	6			

					Cost Per Ton	Amount
No. Miners						
No. Co. Men		Inside Cost				
Avg. Tons per Miner		Outside Cost				
Avg. Tons per Co. Man		Supervision and Clerical				
		Yardage	Tons @	$		
		Development	Tons @	$		
		Paid Miners	Tons @	$		
		Paid Miners	Tons @	$		
		Paid Miners	Tons @	$		
		Co. Coal	Tons @	$		
Budget Production		Actual Production	Tons	Cost		
		Brought Forward	Tons	Cost		
Previous Month	Standard	To Date	Tons	Cost		
Days Worked		Average Production	Tons			
Cars Dumped Today		Average Tons Per Car				
Cars Dumped This Month		Average Tons Per Car				
Average Tons Per Car Last Month						

Signed......................................
Superintendent.

Remarks

tracted much attention was the screening practice standards. A standard is set up for each mine and the monthly reports show "just what is gained or lost by variations from this standard. If more lump or nut than standard is made, it will reflect as a credit balance to the mine. If less nut or lump and more slack is made, we will charge the mine with loss, holding it as a balance against the mine until the mine overcomes it by decreasing the slack percentage."

Because of irregular operation, it is impossible to set a standard operating cost which would be applicable month after month without change, said Mr. Bullington. "This makes it necessary to set up a standard expense for idle days (see Fig. 9). The idle-day standard should include the actual cost of laying the mine idle for one day, such as superintendent's salary, office expense, pit boss, inspectors, fan and pump operators, and other men who are required to work to keep the mine open whether coal is hoisted or not.

"This idle-day standard multiplied by the number of days lost from regular working time gives us a figure which is deducted from the total cost before figuring the actual cost of production for the month. This idle-time cost is not considered a part of the cost of mining coal. The total cost less the standard idle expense for the month gives us a cost for which we can hold the operation of the mine strictly responsible."

The idea of idle-day standards was commented upon enthusiastically by B. F. DeVinny, treasurer, Liberty Fuel Co., Utah, who presided during the presentation of Mr. Bullinger's paper. The author explained, in response to an inquiry from Mr. Kaseman, that any work which should be done during an active day, but which is postponed until the mine is not loading, is excluded from the idle-day standards.

Compensation costs are charged directly to the mine at which the accident resulting in the payment of compensation took place. Messrs. Dalrymple and Fearn were much struck with this plan and expressed the belief that it would have a healthy influence in keeping down accidents.

Fig. 9—Idle-Day Standard

Account	Mine
10—Mule Haulage	$10.00
25—Ventilation	6.52
26—Timbering	6.52
27—Track Maintenance	6.52
28—Handling Rock	6.07
29—Drainage	6.52
31—Rock Dusting	6.52
32—Mine Top	5.04
67—Supervision and Clerical	10.97
68—Mine Supervision	8.00
Power	5.20
Total	$77.88

Fig. 7—Monthly Detailed Cost Analysis—Operating

Fig. 8—Monthly Detailed Cost Analysis — Maintenance, Repairs, and Power

Fig. 6—Monthly Cost Sheet

Coal Age

Sydney A. Hale, *Editor*

New York, July, 1931

Higher coal rates

SYMPATHY with the present plight of the railroads of the country is so widespread that a note of dissent from ready indorsement of their plea for a general increase of fifteen per cent in freight rates sounds harshly ungracious. And yet, because the plight of the coal industry—particularly the bituminous section of the trade—has been and is even more distressing than that of the carriers, a cautious weighing of the possible effects of higher transportation charges upon the free movement of coal traffic seems neither improvident nor unwise. If the proposed increase were to have the effect of further reducing coal tonnage, the advance would work injury to both railroads and coal producers.

With coal such a substantial part of the revenue tonnage of the steam railroads, that is a consideration which should not lightly be dismissed. No coal district has a monopoly of any business and the industry as a whole is challenged on all sides by competitive fuels which pay little or no toll to the railroad lines. Judged by the usual criteria for rate making, coal today, in the opinion of many experts, is carrying an excessive proportion of the rate burden. If this be true, the proposed advance would accentuate this unfavorable condition.

The past record of the coal industry in rate-advance cases is convincing proof that the operators have never been unfriendly to the railroads. Indeed, the general indifference of the producers to all changes in rate levels which did not affect inter-district adjustments or differentials has laid them open to the charge that they have been apathetic to the interests of the commercial consumers of coal. But it would be unfair to expect the industry to carry its sympathy for the railroads to the point where it is harmful to the future of coal—especially as any loss in commercial business hits the coal producer two ways, since it also entails a diminution in railroad fuel consumption.

Dangerous doctrine

OPPOSITION of union organizations to the promotion of the use of labor-saving devices where that opposition is unaccompanied by violence or coercion, has received the stamp of approval of at least one state court of appellate jurisdiction. In *Bayer v. Brotherhood of Painters, Decorators, and Paperhangers of America, Local* 301, the Court of Errors and Appeals of New Jersey has decided that the union was within its legal rights when it refused to recognize a spray machine in which the complainant had a financial interest "by prohibiting its use by their members, or the recognition of any employer using said machine or associated in any way with the use of one." An injunction issued against the union by the trial court was set aside on appeal, and the bill of complaint was dismissed: 154 Atl. 759.

Whether this is good law outside of New Jersey is not the fundamental consideration. Granted that the court is sound in its construction of the statutes, the fact remains that the economic doctrine followed by the union is a dangerous one—more deadly in its final flowering to organized labor than to any other group of citizens. Progress is brutal as well as glorious, riding over opposition like a juggernaut whether that opposition be against a paint spray, a motor car, or a loading machine. Those who would destroy progress end by destroying themselves.

And now Mr. Ford

HENRY FORD is testing coal as a fertilizer, and James C. Young, in the New York *Times Magazine*, says: "It may be doubted if anyone ever before thought of coal as an essential part of fertilizer. Mr. Ford says he does not know; he is trying to find out; but he is sure of one thing—if coal proves to be a fertilizer, it will be cheaper than most commercial brands. In greenhouses the coal fertilizer has worked well enough. It remains to be seen whether results in the field will prove of value."

Entrance of this spectacular industrialist into this field of research must be welcome to those seeking to expand the uses for coal, even though he will not be exactly the pioneer Mr. Young suggests. Mr. Ford has been forestalled in his experiments by Germany, New Zealand, and Czechoslovakia. In the United States coal has been used on the Pacific Coast, in Pennsylvania and Colorado. For many years *Coal Age* has been urging experiments in this direction. The Pittsburgh Coal Co. has tested the agricultural possibilities of fine coal with success. Everyone who has used it has found it helpful, at least for some crops.

Nor is it surprising that coal should have in it chemical compounds in assimilable form. They may not be as active and as readily convertible into vegetation as plants which have recently decayed, or as humus which carries such vegetation in the form of black mold, but it is to be surmised that it should have value. Because it has been demonstrated without question that a tree will increase in weight altogether out of proportion to the decrease in weight of the ground in which it grows and because carbon can be taken from the air is no reason for asserting that carbon cannot be absorbed from the soil in which plants grow. Even if it should prove to be true that all the carbon comes from the atmosphere, it nevertheless is conceivable

that sulphur, nitrogen, phosphorus, calcium, titanium, silicon, manganese, and other helpful elements may be absorbed by vegetation from the soil less readily than from the complex constituents of coal which are the same or similar constituents to those found in humus.

Coal also may have a value as a material for lightening soils, especially as it is light in itself and does not sink like sand but remains on the surface, where it is needed. By its reduction in bulk it may keep the soil open and may thus promote the capillary action of the soil in raising water to the surface. The prompt response of the soil to such treatment suggests, however, that the value of coal is bio-chemical rather than merely physical.

Agricultural colleges that dismiss coal with a shrug would do well to test it rather than asperse its value without a trial. There are too many unknown factors to permit conclusions that do not have empirical justification. Mr. Ford, with his fine contempt for dead tradition as a controlling precedent, should be a powerful ally to those who demand facts rather than opinions in this field.

Inadequate support of road roadways

CONVENIENCE has heretofore dictated the placing of props rather than the need for roof support. Rooms have been heavily posted in the gob, where there were no men to be safeguarded, and not supported at all in the roadways, where a fall of rock would be likely to kill or injure a man. A. Winstanley, as quoted in the "Notes from Across the Sea" of this issue, rightly calls attention to the compression of the roof near the coal face, especially where the coal is kept more or less rigidly in place with sprags pushed into the undercut. This compression will hold any loose rock in place. Further from the coal face the roof becomes extended rather than compressed and pieces drop out, but that matters less, because at such points rarely are any men present to be killed and injured.

But in the roadway not only are the props further apart but men work far enough back to be under tensilely stressed roof. On either side of the mine car clearance must be provided; at least so it is said or thought; cars are getting larger and crosscuts often are now driven obliquely, thus greatly increasing the area of unprotected roof, which at best in the roadway is supported only by its natural strength. Cross planks or corrugated steel straps are greatly needed in such places and should be provided.

Not because timbering cannot be made adequate but because men will not expend the needed trouble and expense to make places safe or will not willingly accept the inconvenience that accompanies safety, are so many men injured and killed. It is worth money to the operator to save the lives of his employees. It is money in the pockets of the men to keep themselves safe, and this additional extra trouble surely is worth while. Why, then, do we hesitate?

James Dalrymple, at the Rocky Mountain Coal Mining Institute, well insisted that the roadhead should be protected, because the men do 90 per cent of their work in that area and because 80 per cent of the face accidents in Colorado occur there and there alone. The same is true, in at least a degree, in England, according to authorities.

Accidents at the roadhead are not accidents but the result, only too often, not of a perverse roof condition but of a perversity in human nature that refuses to recognize a danger that is plainly imminent. Some have already apprehended this difficulty. They and their men have guarded against it, but the practice should be general wherever the precaution is necessary.

Graveyard whistlers

EXAMINATION of the statements which have appeared on the subject from time to time might easily persuade a neutral observer that moderation is inherently incompatible with any discussion of the natural-gas situation. Those interested in the renascence of this fuel have not been soured with pessimism in the presentation of their claims. And they have been matched, in part at least, by a small group of coal men and railroad spokesmen who have cheerfully read them out of court.

Cheerfulness in the face of danger is a commendable attribute—if companioned by a willingness to recognize the realities of the situation and their implications. Underestimating the potential strength of the enemy is not the proper basis upon which to plan a successful campaign. Yet that is just what this group which dismisses natural gas as a highly overrated bugaboo seems to be doing.

The assumption that 20,000,000 or 25,000,000 tons represents the maximum which bituminous coal can lose to gas creates a false sense of security that is more dangerous to the coal industry than the most extravagant claims of the natural-gas interests. This assumption hardly squares with the known losses in Alabama and in the Rocky Mountain region. It does not match up with the statement of F. W. Robinson, vice-president, Union Pacific System, that the displacement of coal by natural gas in 1929 cost the railroads $132,750,000 in revenues.

What is needed is a display of vigor by both the coal operators and the railroads in combating natural gas before that fuel obtains a foothold. Vigor such as that recently shown by the Burlington and interested operators when close figuring by the mines and a reduction in the freight rates on slack by the railroad won sugar-beet factories in the North Platte valley to a five-year coal contract could never have been inspired by a massed choir of graveyard whistlers.

NOTES

. . . from Across the Sea

WHILE we in America have been talking about roof action and making measurements with tape, transit, and level only, and almost wholly on the surface of the ground, A. Winstanley, in Scotland, has been making measurements underground, using dynamometers to measure the resistances of props to roof pressure; autographic subsidence recorders to give continuous records of the variations in distance between roof and floor; strain gages to indicate compression or tension in the floor and in the immediate roof; and leveling instruments to measure changes in the inclination or deflection of the same and to determine separately the roof and floor movements.

Says Mr. Winstanley in a paper read before the Mining Institute of Scotland, in Edinburgh, Scotland: "Mathematics applied to the subject only makes confusion worse confounded." Perhaps he is right. He certainly will get "the sound of a loud Amen" from a number of investigators in America when he rolls forth that dictum. But Mr. Winstanley nevertheless found some conditions that verify the ideas of the mathematically inclined.

He found now tension and now compression in the roof, the one changing to the other. A built-in beam—and every drawslate is built in, being squeezed over the pillar by the heavy overburden—is in compression near the pillar and in tension beyond; in severe compression, because as a built-in beam, however imperfectly built in, it tends to be horizontal over the edge of the pillar, and because as lying under a free beam—the true roof—it is compelled to drop at a considerable angle to the horizontal at the selfsame point. As the drawslate is thus given a flexure that is not the outcome of its own self-loading, it must have a sharp curvature involving a severe compression near the rib edge.

Mr. Winstanley says that when the mine roof is in tension, the breaks in the roof open and let down the fractured rock. When the roof is in compression, the faces of the crevices are nipped together and the rock does not fall. The change in stress which comes when the roof near the coal face by the progress of mining becomes roof at some distance therefrom makes vigilance necessary. Mr. Winstanley does not say, it is true, just where the compression is found and where the tension, but it is probable that the compression that nips the rock is near the face and the tension is experienced further therefrom. This should tend to make the "working lane"—the space between the longwall face and the first row of props—safer than the gob adjacent.

Subsidence records, says this observer, show that the roof is continually subsiding near the working face but not at a uniform rate. Subsidence was found to be more rapid when the coal was being undercut or "stripped" (apparently, coal which is removed from the face by shooting or picking is said to be "stripped" from the seam).

To a lesser extent subsidence increased whenever supports were being withdrawn from the wastes. As coal was being cut, a wave of subsidence traveled with and extended a short distance in advance of the machine, even though sprags in the undercut were set at not less than 6-ft. intervals. But none of these findings will "confound" the mathematician. He would be disposed rather to confirm than to be surprised at them.

When undercut coal was being stripped, crush recurred, but generally to less extent than when it was being undercut. Stripping of coal without undercutting increased local subsidence sharply. At periods when no work was done on the longwall, the rate of face subsidence gradually decreased, but in every case, even after several days' stoppage of work, the roof still continued to subside.

When they were placed the dynamometer props were driven into position and they were, therefore, from the first slightly loaded, but the resistances usually increased with lapse of time. Undercutting and stripping increased these resistances distinctly, and in less degree so did the withdrawal of supports from the waste. Decreases were recorded when lids or footpieces were being destroyed by the crush or the props sank into the floor, showing apparently that the dynamometric equipment did not measure the normal pressure but only the resistance which the dynamometer prop exerted in opposing it. If the prop had given greater resistance it would have been more heavily loaded. The load was there but the prop refused to carry all of it.

Micrometer measurements on the props showed that their loading often was off-center, so that parts of the props frequently were in tension. Undercutting or stripping of coal almost invariably caused the props to swing, but not all in the same direction.

In the longwall work described, steel props 4 in. in diameter were used and set near the ends of corrugated steel straps $4\frac{1}{2}$ ft. long. These steel straps, Mr. Winstanley believes, saved the props from some of the eccentricity of loading and swinging which had an especially bad effect when the props penetrated the floor and accordingly bent more than ever.

In editorials, *Coal Age* has had occasion to refer to the passage of air through pillars, remarking that if water will travel through the coal seam, air is still more likely to do so, because of its greater "fluidity." Though the water is under high compression and the air under only light pressure, it is quite readily conceivable that when the water leaves the coal, the spaces left may serve as conduits for the air.

In fact, the water in its passage may have dissolved and thus removed constituents of the coal, thus aiding in its passage and thus aiding also in the passage of air after the water has been drained off. The movements of the floor, due to unequal compression and due also to the swelling of its limey constituents, may open up pillars. Compression may also crack the pillar and drying may cause it to shrink.

The idea that pillars leak is enunciated by Prof. Henry Briggs, head professor of mining, University of Edinburgh, Edinburgh, Scotland, in *Colliery Engineering*. Most airways, says he, are ducts with porous walls. The volume of air escaping through partly consolidated goafs, through cracks in coal pillars, and in the roof, and through defective doors is surprising. He then proceeds to treat the subject of leakage mathematically.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Policy and Ethics in Business, by Carl F. Taeusch, Associate Professor of Business Ethics, Graduate School of Business Administration, Harvard University. McGraw-Hill Book Co., Inc., New York City. 624 pp.; cloth. Price, $5.

The business man genuinely interested in self-government in industry will do himself a disservice if he allows the sheer bulk of Prof. Taeusch's volume to postpone its careful perusal. The author is dealing with a big subject upon which little in a collected sense has been published. He is never dull, and many of his pages crackle with mordant thrusts at stupidity in the chambers of government and in the councils of business.

His approach to his subject is the

development of the thesis that business was regulated first by the church wholly in the interest of the consumer and that, when the state superseded the clergy in these control functions, there was no change in doctrine. It is only recently, he argues, that there has been even partial recognition of the fact that unfair harassment of a competitor in business may be as anti-social and as uneconomic as gouging the ultimate consumer. That, in many cases, unfair competition is born of ignorance or misunderstanding does not lessen its damaging effects upon the business structure and upon public confidence in industry.

Prof. Taeusch prefaces his study of case material with a swift review of the effect that geographic isolation, climate, topography, racial stock, religious and social ideals, sectional differences, the pioneer spirit, and the disappearance of the pioneer frontier have had upon business development and on thinking upon business policies in this country. This meaty sketch, compressed into 52 pages, illuminates sharply the shadowy background out of which many present-day conflicting ideas and passions have emerged. As in the introduction to "The Encyclopædia of Social Sciences," the average reader who has taken most things for granted, gains a much wider view of the inescapable interplay and interrelation of many developments not commonly associated with business in a narrow sense.

With his reader thus orientated, the author proceeds to a brief history of the Sherman law and an analysis of the changing viewpoints in its interpretation. This is supplemented with studies of certain decisions of the Federal Trade Commission in which the ethics of business policies are involved and with further material drawn from reports of the Better Business Bureaus and the Harvard Graduate School of Business Administration. These studies cover such subjects as full-line forcing, extension of functions and mergers, management relations, legitimate trade channels, trade association activities, resale price maintenance, price discriminations, price cutting, reciprocal buying, competitive bids, commercial bribery, trade piracy, misrepresentation, espionage, advertising, cancellation of contracts, commercial arbitration, and limitation of production.

Summarizing his conclusions on the last-mentioned subject, the author says:

> The chief point in the problem of limitation of production consists in shifting a part of attention away from the concern for the consumer to a concern for the trade health of the producers. Intelligent control of production on the part of producers is as much an ethical right as is that of the consumer to an abundance of goods at low prices. The producer's right can best be safeguarded by his avoiding the two extremes: under- and overproduction.

The former, he remarks, is the more disastrous in its effects upon business because it encourages undue expansion. Overproduction, he thinks, can best be overcome by intelligent control of inventory and sales promotion among individual distributors "and the employment of statistical figures by the seller to a degree commensurate with the use of such figures by intelligent buyers."

Occasionally, of course, the author nods in his statement of facts, as when he says that the anthracite tonnage tax was enacted by the State of Pennsylvania at the behest of the hard-coal producers "to maintain prices on what was regarded as a monopoly product." These slips, however, are so few that they do not affect the value of the work, which lies primarily in the discussion of policies and ethics rather than in examination or elaboration of factual premises.

S. A. H.

* * *

Etudes Techniques du Groupement des Houillères Victimes de l'Invasion. Tome V—Aerage, Ventilateurs (Technical Studies of the Group of Mines, Victims of Invasion. Vol. V—Ventilation, Fans). By M. Lahoussay, chief engineer, Technical Services, Central Committee of French Mines. Gauthier-Villars et Cie, Quai des Grands-Augustins 55, Paris, France. 105 pp., 9x11 in.; paper. Price 40 fr.

In order to record the studies made by and for the Central Committee of French Mines, for the purpose of ascertaining the best engineering methods of repairing the ravages of the war, that committee decided to publish several volumes, of which this is the fifth; and let us hope by no means the last. The first dealt with the destruction sustained, the clearing away of the wreckage, and the dewatering of the mines; the second with ropes and hoisting drums; the third with hoists; the fourth with compressed air; and the present number deals with ventilation and ventilating equipment.

Our French cousins have done much to advance the art of mining; more, it may well be, than is in the popular mind credited to them. Some day the names of distinguished French mining engineers may be set down here in imposing array, but not now. Perhaps in no direction have they more distinguished themselves than in the art of ventilation.

The first chapter of this volume deals with ventilation in general, with resistance, equivalent orifice, functioning of fans, characteristic fan curves, different types of fans, choice and use of equipment, and with natural ventilation. Striking features are references to forward-, straight-, and backward-bladed fans; the use of fans in series and in parallel. Another chapter is given over to anemometers and Pitot tubes with their use. A third discusses experiments made with mine fans, and the last concerns itself with researches on the industrial use of belts, a relevant study because the fans were to be driven by that means.

Readers will be interested to notice that all the *évasé* air stacks illustrated are of great height. Just how high is difficult to determine, for one and all of them have been cropped off in the making of the illustrations. Why they are made thus high is matter for interest, but the book unfortunately does not concern itself with them. The height was necessary seeing that the fans have been placed in buildings almost as high as those housing our city central-station machinery. They had to be made higher, of course, than the tall structures that contain them. But perhaps there was a desire also to remove the fan effluent as far as reasonably possible above the working level.

In some parts of France there are heavy disengagements of gas, methane, and carbon dioxide, and it is just as well to provide for the discharge of these at levels many feet above the surface. Surely in countries with narrow valleys, with the possibilities of recirculation, it might be advantageous either to put the fan high up on a hillside with a duct leading to it, if there is a hill near by, or to build an *évasé* stack up the slope of the hill, leaving the fan at the base. The former plan would seem preferable, for the long *évasé* gets excessively large as it soars upward, is liable to fall in a mine explosion, and leaves the fan as near the shaft as it is at present.

An interesting passage in the book runs as follows: "Nearly all the airshafts are provided with two fans. These function alternately, but nothing should interfere with their simultaneous operation." Speaking of operation in parallel, the author adds: "It is easy to understand how complex conditions might become if the characteristic curves of the two fans were not the same." The four fan plants illustrated in this book have water gages of only 5.89, 5.50, 5.50, and 5.11 in., respectively, so the French practice in this respect, while trending toward higher gages than ours, is not so far out of line with our practice as the German seems to be, though this fact may be due to opportunities offered the owners and their engineers during reconstruction.

What speeds of the air are customary in the Nord and Pas de Calais field may be judged from the fact that the author says: "Mine anemometers are in general graduated for speeds below 2,000 ft. per min. But we may be obliged, in certain cases, to utilize these measuring instruments in much more violent air currents. Tests we have made have shown us that with good anemometers the curve from which indications may be interpreted will follow a straight line up to 3,500 ft. per min., that is to say, the formula $v = a + bn$ determined for v when less than 10 will serve equally for v when between 2,000 and 3,500 ft. per min. In the mines this latter limit is practically never passed." The speeds quoted are, as expressed in larger units, 22 and 40 miles per hour.

The ventilating committee of the American Institute of Mining & Metallurgical Engineers has under consideration the suggestion that the length of airway through which air travels at 2,000 ft. per min. shall not exceed 100 to 500 ft., which seems a rule that can be and possibly should be followed in the United States but may be impracticable in France.

R. Dawson Hall.

THE BOSSES TALK IT OVER

VENTILATION CONTROL—

Scientific vs. Rule-of-Thumb Methods

"Seriously, Mac," inquired the super, "how good is the ventilation of our mine, in your opinion? Have we any weak spots, and where are they?—places where resistance or leakage is abnormally high."

"Why the father confessor act, Jim?" parried the foreman. "You know our method. We make anemometer runs every month or so and take water-gage readings at suspicious points. Besides, we search for leaky doors and stoppings. Generally speaking, our ventilation is pretty good."

"It's quite evident you don't know the exact condition of our ventilation system. Frankly, I don't myself. But that's neither here nor there. We are going to find out."

"Yeah!" exclaimed the astonished foreman.

"Yes," returned Jim, with conviction. "The Old Man expects us to put ventilation on a scientific basis and to follow up with ventilation surveys, just as we do our mining surveys."

WHAT DO YOU THINK?

1. What system do you follow in checking up on ventilation?

2. What instruments and methods do you use?

3. What factors do you emphasize?

4. Do you maintain a ventilation map? If so, how is it drawn and what data do you carry on it?

All superintendents, foremen, electrical and mechanical men are urged to discuss the questions on page 374. Acceptable letters will be paid for ▸▸▸▸

Should foremen receive a bonus for freedom from accidents in their sections? Mac and the super discussed this question in June. What the reader thinks is told in the letters following.

Pay the Foreman Adequately And Avoid the Bonus System

The bonus system may be all right, but I subscribe more to the theory of paying the foremen a salary sufficient to reward them for all their duties, one of which is to look after the safety of those under their supervision. If an accident occurs on a man's section, and investigation shows that he is responsible for it, that boss should be disciplined. Another thing: on too many occasions, the assistant is held down by costs and then blamed, only to cover up the bad management of his superiors, when the inevitable accident occurs.

At our mine a system of monthly safety meetings has been in vogue for some time. As each man passes through the door to the meeting he is handed a cigar. When the meeting is called to order, the chairman asks for a report of the suggestions made at the previous meeting and whether they have been complied with. Then the accidents of the preceding month are discussed, and methods suggested to avoid a repetition. Every man on the job is encouraged to make suggestions that will improve safety.

It seems to me that the spirit shown by the management has much to do with the success of a safety movement. There should be no high hatting or spirit of "I am holier than thou" in the organization. At our plant we have no safety police and yet I have seen no violation since I have been here.

C. E. Montgomery.

Milburn, W. Va.

The Workers, Not the Bosses, Should Be Paid Safety Bonuses

Dad's plan is good, but I believe I have a better one. As safety begins at the face, start the bonus there. Here is the plan:

Suppose a mine has 150 miners. To supervise this group of men properly, one general mine foreman and six assistant mine foremen would be required. This gives each assistant mine foreman 25 men. Create six funds, one for each section. Give each fund $10 every month its section operates without a lost-time accident.

Each month the whole mine operates without an accident, deposit $14 in each fund instead of $10. When a fund amounts to $30, call a meeting of all the men on the section and let them decide how to spend the fund. It should be spent for a banquet, show, smoker, or similar entertainment. This, I believe, will give the men who are exposed to danger a keener interest in accident prevention, a better feeling toward the company, and a better understanding of the officials. M. B. C.

Thomas, W. Va.

Why Use the Term Bonus— Is Not "Gravy" a Better Word?

Systematic payment of bonuses has become an integral part of business procedure throughout the United States. In fact, judging from practices honored by large steel and tobacco corporations, the payment of bonuses assumes amounts that run into the millions. With this in mind, the almost negligible sums offered in coal mining as bait to inspire the *n*th degree of effort toward a certain end, be it to promote safety or any other desirable objective, has the flavor of a Scotch joke. The problem as I see it is not so much that the objective be assured but rather whether the same end might not be gained by other measures, and whether the bonus be paid to the most deserving party.

In the war period a certain coal corporation purchased a large coal property to increase its output of fuel, which was in great demand. At first, anything was coal if it was black. Then came the post-war period with its sobering realities. Protests from consumers reawakened a sense of discrimination. The coal was dirty, and besides, they wanted lump coal. Mine-run was "out." Four and six-inch mesh screens were hastily jolted from their rusty moorings and the coal was separated three ways: into lump, nut, and slack. That started something. The percentage of slack was astounding and every available storage track was stacked with row upon row of flats of screenings—unbilled. Something had to be done, and out of the impasse came a bonus system.

The mine was divided into four sections, with a room boss in charge of each. An award of $25 was offered the room boss whose section produced the most lump coal and the highest tonnage per box of permissible powder. Also $25 was given to each room boss who raised the tonnage per box of powder beyond the previous high. This applied exclusively to room work. Employees in development entries were rewarded with $25 for the best quality of merchantable fuel and the highest tonnage per box of powder. The mine examiner reported the best shot places as he made his round in the morning, and passed his report to the mine manager, who personally checked results.

In all $75 was given each month, but the employees participated in only one-third of the awards. How much grief and animosity would have been spared, and how much more successful would have been the results obtained, had the employees received all the bonus awards, I can only conjecture. But, knowing human nature as I think I do, it is mighty difficult to make another see the efficacy of any system involving additional preparation and much work, through which the comparatively well paid overseer alone benefits.

On the surface of things the bonus apparently was more than justified. Where the percentage of lump coal was only about 30, as high as 60 per cent was attained. But the situation was not as rosy as it appeared. In this case, as well as in almost every other instance where monetary reward was at stake, many subterfuges were practiced. For instance, it was noticeable that the quantity of powder used for repair purposes rose appreciably, and the average per loader in more than one section was boosted at the expense of the company through connivance between the overseer and employee.

Business depression caused the company to abandon the bonus practice, and the same average was maintained in spite of this. The room boss was made aware that his pay day depended on his sustaining the previous rating. Just where lay the efficacy of the bonus in this case?

This corporation had five operating coal mines, employed approximately 1,500 men, and carried its own insurance. A statement was given out each month as to the relative standings of each mine in the group as to accidents, their cause, etc., with percentages relating to the tonnage hoisted per month and number of employees per mine. Sometimes only a fraction of a decimal separated the mine in first place from the one next in order. We watched eagerly for the monthly report to find out our rating.

During the month of February all

the mines were notified that March, the following month, was to be a no-accident month, and handbills were printed and distributed to every employee. Each room boss had his orders in unmistakable terms. It was not a no-accident month, however, but the reduction was gratifying and greeted with congratulations. Would a bonus have gotten better results? I doubt it.

From my years of experience with and without the incentive of a bonus, I feel that results prove the practice to be of doubtful value. It is my conviction that the same result can be obtained by other measures. And, as suggested, to institute a flat bonus as part of his salary is decidedly unfair to the foremen, for it seldom occurs that any two sections are alike in potential accident hazards. Therefore, to make the foremen the goats for the careless employees is saddling them with shortcomings over which they have slight control at best.

As an alternative for the bonus system, I suggest that safety and accidents be given the greatest publicity. Make a monthly report of all accidents by sections, emphasizing the standing of each on a percentage basis; also catalog each individual employee. See that every employee secures a copy of this report, couched in commendatory language in each non-accident case. A gentle hint, in bold face, that their names are included on the accident list should go to the others. Inspire the competitive spirit between the sections, and wind up the busy season with a get-together smoker. Never let up. Keep up the publicity by singling out an employee every so often under the general heading of "Who's Who" in the safety movement and the part played by him; commend him for his accomplishments.

Leave the so-called bonus to those happy executives who grace the high places and can talk of incentive rewards in six or seven figures. Only, in this connection, the term bonus is not so good. "Gravy" might be a better word.

ALEXANDER BENNETT.

Panama, Ill.

This Public Utility Company Encourages Safety Differently

If a bonus is to be paid to the mine foreman, it should be given to him on the basis of man-hours of supervision for each lost-time accident. However, it seems to me that the wrong man is being paid, for is it not the foreman's business to inform the workingman of any danger that might exist, and show him how to avoid that danger?

By nature, a workman is either careful or reckless, and in very few cases can the careless worker be transformed into a careful one merely by verbal advice. Something more is required. Give the man a bonus for work done without a lost-time accident, and the result will be better not only for the company but for the workman also. This encourages him to take better care of himself. The practice also lessens time losses of one or two days for slight accidents.

A certain public utility not only pays

Forming Opinions

These pages offer a liberal educational course in the broad phases of mine management, an opportunity which no operating man can afford to miss—not even the big boss. Here, new ideas and old are being proved or disproved in discussions which come from many pens. Study of the letters will enable you to crystallize many opinions which are vague in your mind. Contribute to the discussions; send in your letter today.

Publications Received

Explosions in Tennessee Coal Mines, by H. B. Humphrey. I. C. 6,424; 6 pp. Bureau of Mines, Washington, D. C.

A Flame Safety Lamp of High Candlepower, by D. W. Woodhead, Safety in Mines Research Board. Paper No. 65; 15 pp., illustrated. Price, 6d. net. Illumination by means of a Welsbach incandescent mantle is covered in describing this flame safety lamp. H. M. Stationery Office, Adastral House, Kingsway, W.C. 2, London, England.

Limits of Inflammability of Gases and Vapors, by H. F. Coward and G. W. Jones. Bulletin 279; 114 pp., illustrated. Price. 20c. Bureau of Mines, Washington, D. C.

Some Safety Records in Illinois Coal Mines, by A. U. Miller. I. C. 6,417; 23 pp. Bureau of Mines, Washington, D. C.

Supervision as a Means of Preventing Accidents From Falls of Roof and Coal, by W. H. Forbes. I. C. 6,434; 7 pp. Bureau of Mines, Washington, D. C.

The Propulsive Strength and Rate of Pressure Development of the Cardox Blasting Device, by N. A. Tolch and G. St. J. Perrott. R. I. 3,084; 7 pp., illustrated. Bureau of Mines, Washington, D. C.

A Study of Falls of Roof and Coal in Mines in the No. 8 Field of Eastern Ohio, by J. W. Paul and L. N. Plein. R. I. 3,070; 33 pp., illustrated. Bureau of Mines, Washington, D. C.

Some Runaway Car Trips on Inclines at Coal Mines, by J. J. Forbes and M. W. von Bernewitz. I. C. 6,436; 11 pp., illustrated. Bureau of Mines, Washington, D. C.

Washability Studies of the Black Creek Bed at the Bradford Mine, Dixiana, Ala., by B. M. Bird, B. W. Gandrud and C. B. Barmore. R. I. 3,083; 12 pp., illustrated. Bureau of Mines, Washington, D. C.

Some Coal-Mine Safety Organizations in the Pennsylvania Bituminous Field, by R. D. Currie. I. C. 6,414; 39 pp. Bureau of Mines, Washington, D. C.

Washability Studies of the Mary Lee Bed at Hull Mine, Dora, Ala., by B. M. Bird, A. C. Richardson, and G. D. Coe. R. I. 3,067; 24 pp. Bureau of Mines, Washington, D. C.

Safety Cars of the United States Bureau of Mines, by J. J. Forbes and M. J. Ankeny. I. C. 6,435; 5 pp., illustrated. Bureau of Mines, Washington, D. C.

Coal-Mine Safety Organizations in Alabama, by R. D. Currie. Technical paper 489; 48 pp. Price, 10c. Bureau of Mines, Washington, D. C.

Recent Patents

Scraper; 1,791,526. Leslie P. Green, Chicago, assignor to Ira J. Wilson, Winnetka, Ill. Feb. 10, 1931.

Hoisting Mechanism; 1,791,742. Charles F. Osgood, Claremont, N. H., assignor to Sullivan Machinery Co., Chicago. Feb. 10, 1931.

Miner's Pick; 1,791,688. Jay C. Sparks, Clinchco, Va. Feb. 10, 1931.

Coal-Cleaning Apparatus; 1,792,179. H. L. McLean, Scranton, Pa., assignor of one-third to George W. Wilmot and one-third to Francis H. Blatch, Hazleton, Pa. Feb. 10, 1931.

Coal Cleaner; 1,792,440. A. G. Oppy and G. B. Sadler, Welch, W. Va. Feb. 10, 1931.

Conveyer; 1,792,501. George Manierre, Milwaukee, Wis. Feb. 17, 1931.

Mining Machine; 1,794,367. Charles E. Davis, Chicago, assignor to Goodman Mfg. Co., Chicago. March 3, 1931.

Mine-Shaft Gate; 1,794,712. William G. Johnson, Pittston, Pa. March 3, 1931.

Blasting Cap; 1,795,440. William Pritchard, Jr., Wilkes-Barre, Pa., assignor to Hercules Powder Co., Wilmington, Del. March 10, 1931.

Timber Jack; 1,795,548. V. Fazio, Scranton, Pa. March 10, 1931.

Mining-Machine Bit and Bit Holder; 1,795,804. E. P. Stenger and John R. Cartlidge, Cincinnati, Ohio, and Frank Cartlidge, Chicago, assignors to Cincinnati Mine Machinery Co., Cincinnati, Ohio. March 10, 1931.

Mine Car; 1,796,347. Hugh W. Sanford, Knoxville, Tenn. March 17, 1931.

Mechanical Loader for Mines; 1,796,459. A. Y. Hoy, London, England, assignor to Sullivan Machinery Co., Chicago. March 17, 1931.

Loading Machine; 1,796,943. C. A. Pratt, Chicago, assignor to Goodman Mfg. Co., Chicago. March 17, 1931.

Electric Blasting Cap; 1,797,509. H. A. Lewis, Woodbury, N. J., assignor to E. I. duPont de Nemours & Co., Wilmington, Del. March 24, 1931.

Articulated Conveyor; 1,785,402. E. M. Arentzen, Franklin, Pa., assignor to Joy Mfg. Co., Franklin, Pa. Dec. 16, 1930.

Mine-Car Dump-Registering Means; 1,785,433. Joseph J. Body and Rebecca A. Body, Dante, Va. Dec. 16, 1930.

Coal Separator; 1,787,096. Philip Tarone and John Rowland, Ravenrun, Pa. Dec. 30, 1930.

Drive for Rotary Dumps; Erskine Ramsay, Birmingham, Ala. Jan. 6, 1931.

Vibrating Screen; 1,787,852. George W. Behnke and Lewis E. Soldan, Durand, Mich., assignors to Simplex Engineering Co., Durand, Mich. Jan. 6, 1931.

Blasting Shell; 1,787,910. Sterling S. Lanier, Jr., Hopkinsville, Ky. Jan. 6, 1931.

Car-Loading Chute; 1,788,202. Frank Pardee and Frank Pardee, Jr., Hazleton, Pa., assignors to Anthracite Separator Co., Hazleton, Pa. Jan. 6, 1931.

Miner's Combination Tamp and Needle; 1,789,214. William O. C. Carson, Freeman, W. Va. Jan. 13, 1931.

Process for Treating Coal and Like Substances; 1,789,549. William Heckel, Hamborn, Germany. Jan. 20, 1931.

Coal-Washing Apparatus; 1,790,107. W. C. Menzies, Scranton, Pa. Jan. 27, 1931.

Mine Car; 1,790,326. H. W. Sanford and W. O. McKamey, Knoxville, Tenn. Jan. 27, 1931.

its workmen a monetary award for careful work but also gives them written recognition in its monthly magazine. Special service buttons are given to those who have had five years without an accident. This company has enjoyed a steady decrease in lost-time accidents. While this decrease might not be attributed wholly to the bonus system it can be said that the safety drive is commendable and might well be employed in the coal industry. FERRO CASTELLANI.

Frontenac, Kan.

How Indiana Is Handling Its Problems in Mine Safety

I feel that any kind of a bonus system is wrong. We are paid a salary to perform duties intelligently and conscientiously, so why a bonus? A bonus for safety merely adds to the cost of production, which means that the awards to the bosses are taken from the wages of the worker who is expected to cooperate in safety activities. Thus the workers give at two ends and receive nothing in return.

In Indiana we have formed clubs and are taking a course of study in mine safety under the direction of William Forbes, of the U. S. Bureau of Mines. We also have established chapters of the Joseph A. Holmes Association. Our goal is to gain a knowledge of how to go about our work both systematically and safely. Even though we become thorough in the knowledge of safety as mine foremen we have a bigger job before us. It is the training of the careless worker in our section, who is continually getting hurt. We can't discharge the fellow, so we should search for some way to cure him of his dangerous habits.

The situation indicates the necessity for giving the careless worker—and all employees, for that matter—an educational course. That is exactly what we are doing. We are striving to organize safety chapters, at the meetings of which all men are on a common footing. Our aim is to make every man a safety spoke in the wheels of production.

Jasonville, Ind. JOHN H. ONIONES.

Money Awarded as Bonuses Could Be Put to Better Use

As I have passed through all the experiences of bonus giving for accident prevention, I hasten to say, "no, decidedly no—do not put safety on a bonus." It is easy money for some, hard for others, and causes jealousy and ill feeling. A good foreman does not need to be paid to protect his workers. When a foreman has lost-time accidents, the better plan is to take that foreman to account and show him the way to prevent such accidents.

A foreman who receives a bonus for accident prevention will, when he has an accident that deprives him of the bonus, feel riled and dissatisfied. The man or men involved in the accident come in for a share of his feeling of resentment. The theory that men will not take as many chances when their foreman is paid extra to stop them, has been exploded many times in my experience. Bonus money can be put into some better scheme for accident prevention. CHARLES H. WILLEY

Concord, N. H.

If You Must Pay a Bonus Give It to the Workers

The paying of a bonus to mine foremen as an incentive to the prevention of accidents, in my opinion, is a mistake. That plan inspires only a few men with a zeal for safety, whereas accident prevention can come only through the cooperation of every man in the mine. It is the duty of the mine official to do all in his power to promote safety. Any man who shirks this duty, or simulates interest merely because he is being paid extra for it, should be replaced.

If you insist upon paying a bonus, it is my judgment that it should go to the working men. Then you will have established an incentive for the entire body of your organization, and not for one or two officials. The mine foreman spends only a few minutes each day with each worker. The balance of the time the man must depend on himself for safety. This being the case, and because it takes the cooperation of every man in the mine to prevent accidents, why should one or two men be singled out and paid for the doing of a job which actually is accomplished by the entire organization? P. B. ROSS.

Curwensville, Pa.

Trade Literature

Motors. General Electric Co., Schenectady, N. Y.—Squirrel-cage induction motors, GEA-1352; vertical, hollow-shaft induction motors, GEA-1368; fractional-horsepower motors, direct current, GEA-1275. These bulletins are in folder form and illustrated.

Pumps. Worthington Pump & Machinery Corporation, Harrison, N. J.—Horizontal duplex piston pattern oil pumps, Specification Sheet W-112-S10, 4 pp.; power pumps, vertical triplex single-acting, Specification Sheet D-423, E8, 2 pp.

Brushes. National Carbon Co., Inc., Cleveland, Ohio.—Catalog B-131; 11 pp., illustrated. Describes carbon, graphite, and metal-graphite brushes for generators, motors, and rotary converters. Price lists are included.

Crane. Bucyrus-Erie Co., South Milwaukee, Wis.—Bulletin FGA-31; 20 pp., illustrated. Describes the GA-3 gas air shovel-dragline-clamshell-lifting crane.

Belt Conveyors. Fairfield Engineering Co., Marion, Ohio—Bulletin No. 40-1, illustrated. Gives detailed information as to their application.

Chain Drives. Link-Belt Co., Chicago—Book 1,293; 16 pp., illustrated. Seven types of positive drives for the transmission of power are described in this book entitled "A Saving at Every Turn."

Speed Reducers. Foote Bros. Gear & Machine Co., Chicago—Catalog No. 301; 78 pp., illustrated. Worm gearing and worm gear speed reducers are covered, with a short chapter on the evolution of worm gearing.

Condulets. Crouse-Hinds Co., Syracuse, N. Y.—Bulletin 2,218; 48 pp., illustrated. Covers threadless condulets, couplings, and connectors for rigid conduit and electrical metallic tubing.

Control Instruments. Brown Instrument Co., Philadelphia, Pa.—Catalog No. 8008; 48 pp., illustrated. Contains data on automatic controls for temperatures, pressures, flows, etc.

Regulators. Spence Engineering Co., Inc., New York City—File No. 34-G-3 includes various bulletins covering equipment of the Spence company.

Motors. Type HR, "Simplex" Synchronous, are illustrated and described in Leaflet 20,519 issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Cast Iron. International Nickel Co., Inc., New York, has issued Bulletin No. 208 entitled "'Ni-Resist' A Corrosion and Heat Resistant Nickel-Copper-Chromium Cast Iron."

Pumping. Bulletin 71-J, issued by Sullivan Machinery Co., Chicago, describes air-made wells for pneumatic pumping of sand and silt strata.

Locomotives. Brookville Locomotive Co., Brookville, Pa.—Bulletin B-27, 12 pp., illustrating and describing its 4, 4½-, 5-, 6-, 8-, 10-, and 12-ton locomotives with McCormick-Deering power.

Lubrication. Ideal Lubricator Co., Philadelphia, Pa.—28 pp., illustrated. Describes system for applying grease to bearings.

Tachometers. Catalog No. 46, 16 pp., Brown Instrument Co., Philadelphia, Pa., covers indicating and recording tachometers. Illustrations of standard applications of these instruments are covered.

Tool and Shop Equipment are fully covered in Catalog No. 30, 158 pp., illustrated, issued by Joseph T. Ryerson & Son, Inc., Chicago.

Alloys. Buyers' guide, fall, 1930, International Nickel Co., Inc., New York City.

Pumps—Power, vertical triplex single-acting type, D-423-S4, 4 pp.; centrifugal, type UA, two-stage volute, 4 pp., W-318-S2; centrifugal type UL, two-stage volute, 4 pp., W-318-S7; centrifugal, underwriter fire, 4 pp., W-320-S1; rock drills and drill steel shop equipment, 4 pp., W-1200-B1. Worthington Pump & Machinery Corporation, Harrison, N. J.

Tipples and Tipple Equipment. Roberts & Schaefer Co., Chicago—Catalog No. 129; 48 pp. Besides illustrating and describing installation made by this company, specialized equipments and processes are covered.

Turbine-Generator Units, of 3,600 r.p.m. are illustrated and described in the 12-pp. Circular 1,835-A, of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Nuveyor Ash Conveyor System. United Conveyor Corporation, Chicago—20 pp.; illustrates and describes the advantages of the pipe-line system for conveying ashes.

Lukenweld Construction is illustrated and described in a 19-pp. bulletin by Lukenweld, Inc., Coatesville, Pa.

Fuller-Kinyon Transport System for Pulverized Coal. Fuller Lehigh Co., New York City—Bulletin No. 903; 8 pp., illustrated. Application, advantages, construction, and operation are covered.

Rock Drills. Sullivan Machinery Co., Chicago—Bulletin No. 87-F, 7 pp., illustrated, describes three new drifter rock drills for tunneling and mining work.

Arc Welding Supplies. Lincoln Electric Co., Cleveland, Ohio—Section 3304; 20 pp., illustrated. Covers the Fleetweld process stable arc welding rod, Anode, Stainweld A, Kathode, Lightweld and Carbon electrodes, shields, holders, cables, and other accessories.

Meters, Electric CO_2, are illustrated and described in Catalog No. 3,004, 32 pp., of Brown Instrument Co., Philadelphia, Pa.

Regulator, Campbell Feed Water. Atlas Valve Co., Newark, N. J.—13 pp., illustrated. Describes the advantages and cycle of operation. Price-list is included.

Dual-Drive Exciter Sets. Leaflet 20,477, illustrated, covers the construction of the motor, turbine, and generator. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Electric Shovel and Dragline. Bucyrus-Erie Co., South Milwaukee, Wis.—Bulletin E-752; 16 pp., illustrated, covers the 75-B, 2½-yd. mining and general-purpose shovel and dragline.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Dos and Don'ts in the Care and Operation Of Motor-Generator Sets

WHEN generating equipment operates under severe service, as most mining machinery does, states Grady H. Emerson, Birmingham, Ala., it should have the best of care possible with reasonable expense. The housing need not be elaborate or expensive, but the building should be adequate, well lighted and ventilated, and dry. Most mining companies are realizing this and when the machinery is located "outside" it is housed in a durable building of sheet metal or wood, with several windows and a concrete floor. Many companies do not go to the expense of a concrete floor, but such a floor is good practice.

Ventilation should be provided by a ventilator built the full length of the roof. Adequate electric lighting also should be provided, because the generating set operates both night and day and generally seven days a week. When it is advisable to locate the generating equipment "inside" it naturally should be located as near the center of the load as possible. Erection of a barrier or concrete wall, with a door and a ventilator at the top, is good practice. Where the cover is shallow it generally is best to locate machinery on the outside and run cables through a borehole. However, conditions alone should determine the exact course to pursue.

Regardless of where the machine is located, give it frequent inspection and care. Isolated stations generally have an attendant. Even though the set is full automatic, if isolated from the main coal-mine plant it is an economy in the long run to place an attendant with the machine when it is in operation. Any man dependable and of intelligence may be placed in charge, with understanding that he is to summon the electrician if anything serious should happen. If the machine is located near the tipple no attendant is necessary, provided that someone is detailed to inspect the generator occasionally.

When to inspect generator sets and what to look for is of interest. The amount of load, the kind of load—that is, intermittent or steady—and the hours the machine operates, all enter into the routine of inspection. If the machine is required to operate 24 hr. a day, there generally is some time when the machine may be shut down conveniently for 5 or 10 min. While the machine is rotating, breaker contacts may be examined, the relay contacts checked, and a general visual inspection made. Notes should be taken of any minor repairs and the repair parts needed.

After the machine has stopped, look it over carefully for unusual wear. If the motor is of squirrel-cage type, use a gage to check the bearings. This is necessary, because the small clearance in this type of machine cannot be accurately gaged with the eye. This seems unnecessary, but not when it is realized that a bearing may wear enough in a few minutes to allow the rotor to pole, especially if the bearing is made of anti-friction metal. On a synchronous machine, undue wear may be detected with the eye, because the clearance is large compared to that on the induction motor. Incidentally, nearly all motor-generator sets of the latest type are being equipped with synchronous motors. The generator end also should be examined for bearing wear.

It is a good idea to examine the current-carrying joints to see if any are loose or show unusual heating. If a bearing heats unduly, the oil should be changed and frequent inspection made after the machine is restarted. The brushes should be checked and any that are too short noted; look for any loose shunts or scratched places on the commutator. On a synchronous motor check the brushes and see if the slip-rings are bright; a ground on the circuit if caught in time will not burn the ring; the effect is cumulative. The ground will cause the brush to burn a pit, or a teat, on the ring and then the brush begins to arc and with each revolution the damage spreads further around the ring. If the defect is repaired in time, serious damage to the ring may be prevented.

The grounds generally are caused by carbon dust and metal from the ring accumulating on the insulators. This should be removed by blowing the whole machine out with dry air at about 30 lb. pressure. Do not hold the blowpipe too close to the windings; there are vacuum cleaners on the market for this purpose. It may be that they have some advantage in that they extract dust from inaccessible places. As was once before pointed out, do not use an oxygen blowpipe for air pressure at any time. This is dangerous, for oxygen will ignite if it should strike oil.

After the machine has been examined, start it up and see that everything operates normally; if not it pays to investigate. While the machine is running, check all oil rings and make sure they are rotating properly. If the machine is synchronous, it is not necessary to switch the field current at all if the exciter is mounted on the same shaft.

Small repairs should be made at the first convenient time. Delicate and important parts should be kept on hand at all times if delays are to be minimized or prevented. Several brushes for both ends of the machine should be kept in store. It is a good idea to have spare bearings fitted to the shaft. This does not necessarily mean a standard bearing if the machine is an old one. Often the shaft is so worn that a standard bearing is little better than an old one. A few insulating washers of the various types, and tubes to fit, are often time savers and aid in an emergency. Major repairs to either the generator or motor should not be attempted unless equipment and repair parts are on hand to

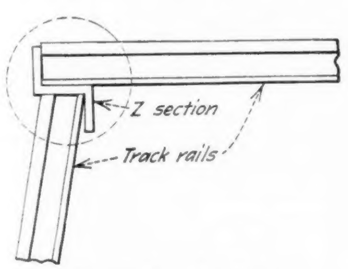
do the job properly. If a shop of adequate facilities is provided and the company has men trained to rewind and repair their equipment it may be done at the mine.

In slack times—say, once each year or every six months—clean the windings of both generator and motor and spray them with a reliable air-dry insulating varnish. At the same time any loose top sticks should be replaced. The armature bands should be renewed if loosened or any loose wires are found. It is a serious matter if a band comes off or bursts in operation, usually meaning a rewind. Sometimes it practically destroys the machine, brush rigging, commutator, and all.

Worn-out bearings, bearing failure, and failure of bands on rotating machinery cause more repair bills than any other defects in electrical machinery. Lightning is blamed for many cases of grounded fields on synchronous generators, when a surge is the real cause. Accumulations of dust between the fields are the seat of much trouble. This dust causes to leak to the ground the high voltage generated in these fields when starting up. It is easy for the 250-volt d.c. to follow the carbonized insulation. The potential to the ground exists because one side of the field circuit is grounded through the generator. The last words governing an inspection are, "look for the unusual."

Z-Section as a Bearing Plate In Timber-Set Design

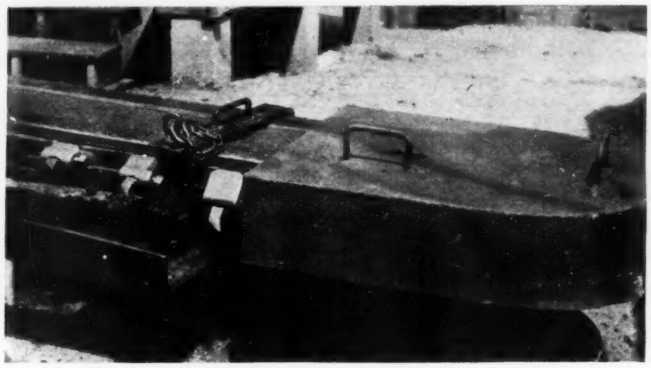
Scrap rails of heavy section can be utilized as beams or collars in the make-up of timber sets by the use of a



Connecting the Leg and Collar

Z-section bearing plate at the two ends, as indicated in the sketch. This arrangement permits the employment of either wood or steel rails as legs of the set.

Locked Cutter Chains Prevent Accidental Starting



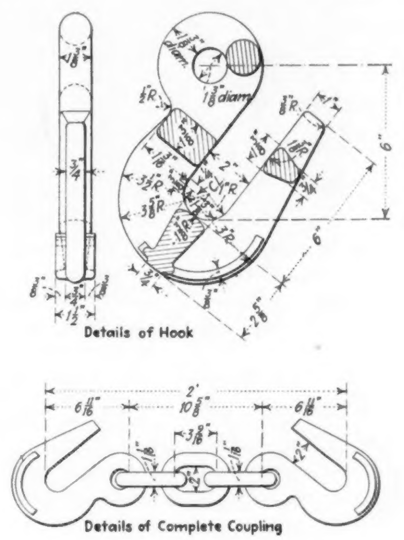
Chain Lock and Guard on Shortwall Cutter Bar

Shortwall mining machines used at mines of the Consolidation Coal Co., Van Lear, Ky., are each equipped with a clevis for locking the cutter chain as a safety feature against accidental starting of the chain. Machine men are required to keep these chain locks in place at all times when not actually cutting the face.

The illustration shows a cutter bar at Mine 155 with the chain-locking clevis in place and with a guard over the end. The clevis will limit the chain movement to 3 or 4 in. in case of accidental starting. Note the convenient arrangement of handles on the guard, which consists of a welded box without a bottom.

Hand-Hold on Coupling Hook Saves Fingers

One of the hazards attending the use of chain-hook couplings on mine cars, a common practice in the anthracite region, is that the fingers are in danger of being caught when the hook is dropped into place. This danger is most prevalent when the coupling hook is of rounded section throughout. Then, the man who does the coupling must wrap the fingers of his hand around the hook. It is the awkwardness of this grip that causes his fingers to get caught and smashed.



Safety Is the Major Consideration In the Design of This Hook

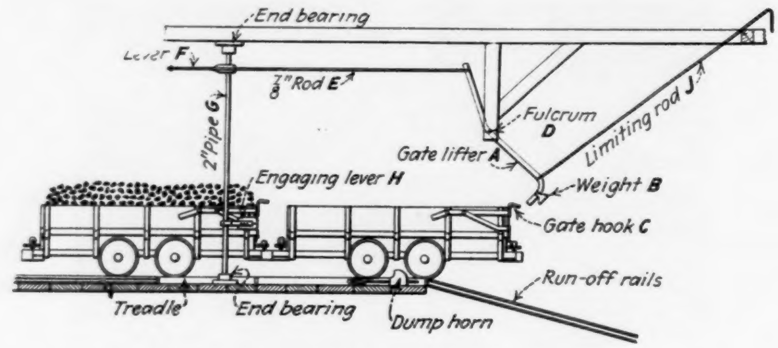
At the Pine Hill colliery of the Pine Hill Coal Co., Minersville, Pa., a coupling hook is in service which was designed by H. F. Brecker, mechanical engineer, to avoid this danger. Its chief feature, shown in the sketch, is a ridge on each side of the hook which serves as a safe hand-hold. These ridges can be formed by welding or be made integral with the hook body by forging or casting. The hooks, and the links also, are made of $1\frac{1}{16}$-in. diameter triple refined iron. Patents on this device are pending.

Solving That Problem

A man who closely follows these pages of operating ideas from month to month will avoid much wasted effort in his every-day job. The problem he faces is simultaneously being encountered by his neighbor or an operating man in some distant field. Somewhere, someone has solved that problem. The solution of that problem and many others may be found in these pages. However, as a man won't want to take all and give nothing, those who borrow from these pages can likewise contribute to them. Certainly you have solved some operating problem by a mechanical or an electrical trick fresh from your brain. Send in your ideas and *Coal Age* will pay $5 or more for each of those accepted. A photograph or sketch should accompany each idea.

Mine Car Gate Lifter Made Automatic

At a mine in southern Illinois a mine-car gate lifter has been installed at a cross-over dump, which functions automatically. In giving the details of this device, Walter E. Buss, mining engi-



Loaded Car Releases the Gate Lifter From the Preceding Empty Car

neer, Vincennes, Ind., states that it can be built by any competent mine blacksmith, using materials found at the plant.

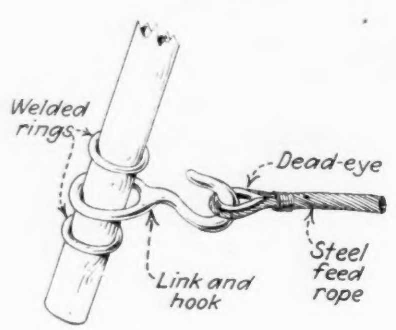
Referring to the sketch, the gate lifter, *A* is pinned as a fulcrum through a hanging support at *D*, and sustained in normal engaging position by a limiting rod, *J*. The weight, *B*, insures that the gate lifter will assume this position, ready to engage the gate hook *C*. The exact design of the gate lifter will, of course, depend upon the style of gate hook in use.

When a car just dumped is to be released to make way for a succeeding load, the latter immediately before mounting the treadle rails which open the horns on the dump contacts with the engaging lever *H*, which is clamped to the 2-in. pipe set in end bearings at the side of the truck. This lever in turn rotates the pipe, *G*, to which is fixed a lever, *F*. The motion of this lever is communicated to the gate lifter through the connecting rod *E*, raising it free of the gate hook and thus releasing the gate a moment before the car is released.

This Hitching Eliminates Foot Block

Instead of anchoring the feed rope of shortwall cutting machines by a foot block under the jack pipe, the Glogora Coal Co., Glo, Ky., uses a hook and dead-eye for this purpose. The hook, writes Walter Hornsby, is welded to a link which is passed over the jack pipe and this link is held in place by two rings which are welded to the pipe. As the distance between these rings allows the link some play, the hook will swing into line with the rope. If the floor is soft, the rings and link should be placed several inches higher than for cutting on hard bottom.

Feed Rope Is Attached Directly to Jack Pipe



Drive Cuts Powder Consumption Almost One-Half

Marked improvement in any phase of operation is unlikely of accomplishment unless the foreman or superintendent in charge of the mine is giving the warranted specific attention to that particular phase. As an illustration, the case of a 2,000-ton mine can be cited, at which, recently, the percentage of lump was materially increased and the percentage of slack reduced by imposing a closer limitation on the quantity of explosive used.

At this mine the loaders are charged with the cost of the explosives. Up to a few months ago the limit per day that each man could obtain was ten sticks of Monobel and three caps. The cost was approximately $1, and as a rule each loader called for the limit. Gradually the limit was decreased to six sticks and three caps for most of the mine, and to five sticks and three caps for one section. This reduced the miner's expense to 65c. or 57c. Coincident with the reduction in explosive, strict enforcement of a regulation calling for the use of bugdust shovels was attained.

Because as a whole the mine is known to be efficiently managed this marked improvement in shooting practice provokes curiosity as to why it was not accomplished sooner. The superintendent said, "Yes, from time to time representatives of powder companies made inspections and recommendations, but we just didn't do much about it. You know how it is—it seemed that there were always too many bigger problems to fight. When market conditions made lump and slack percentages the biggest problem, we got busy and made the improvement."

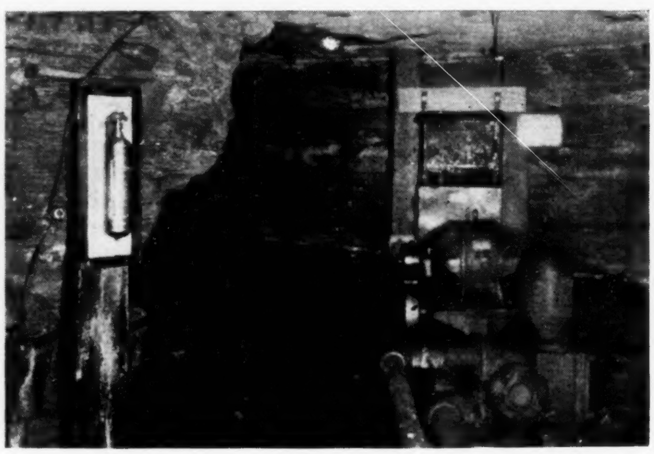
It would be unsafe to draw conclusions without more complete information regarding the mine and its practices, but, assuming that the superintendent is a man who uses his time efficiently, it would appear that he needs an assistant, so that all possibilities of turning out an improved product at a lower cost can be given proper attention.

Red and White Board Frames Fire Extinguisher

Because fire extinguishers are for emergency use and are most effective at the start of a fire, when perhaps only an employee untrained specifically in fire fighting is present, the extinguishers should be mounted in a conspicuous place which calls attention to their presence.

The accompanying reproduction of a picture made in Mine 153 of the Consolidation Coal Co., Van Lear, Ky., shows the standard method of mounting a carbon-tetrachloride extinguisher beside each electric motor used in the mines. The picture, however, fails to display the extinguisher mounting to the extent that it is visible to the eye, for what appears to be a black border around the gleaming white background of the extinguisher board is a bright red border. The motor equipment in this photograph is driving a 100 g.p.m. gathering pump.

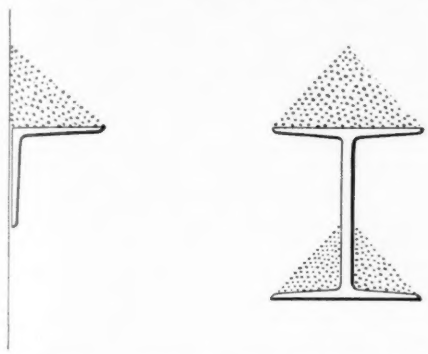
The Extinguisher Is More Prominent Than the Motor



Rock Dust Combats Coal Dust In Dry Cleaning Plant

There is a limit to the quantity of coal dust that can collect on a ledge. Clean off all of the coal dust and load the ledge to the limit with rock dust and considerable time will elapse before an objectionable quantity of coal dust can be retained, is the reasoning behind a practice in the dry cleaning plant of the Lincoln Gas Coal Co., Washington, Pa.

At first attempts were made to clean the coal dust from all ledges and flat surfaces in the building, with the exception, of course, of those on the interior of the expansion chamber. It would have been very expensive to keep up the cleaning in a sufficiently thorough way, including the ledges accessible only from ladders or scaffolds, and do it often enough to assure desired limitations.



Building Members Loaded With Rock Dust

This led to the trial of loading the ledges to the limit with rock dust after a thorough cleaning. The company has not had sufficient experience with the method to determine when the thorough cleaning and rock-dusting should be repeated.

Fractured Engine Bed Welded With Bronze

Accidental overloading of a hoisting engine at a coal mine in western Pennsylvania caused the engine bed to be badly fractured; the front end was broken off and the crosshead bearing cracked. This engine bed weighed 17,500 lb. Details relating to the repair of this damage were given in a recent issue of *Oxy-Acetylene Tips.*

The engine bed was taken into the repair shop and lined up for bronze welding, a pneumatic chipper being employed to prepare the cracks. This much of the job is shown in Fig. 1.

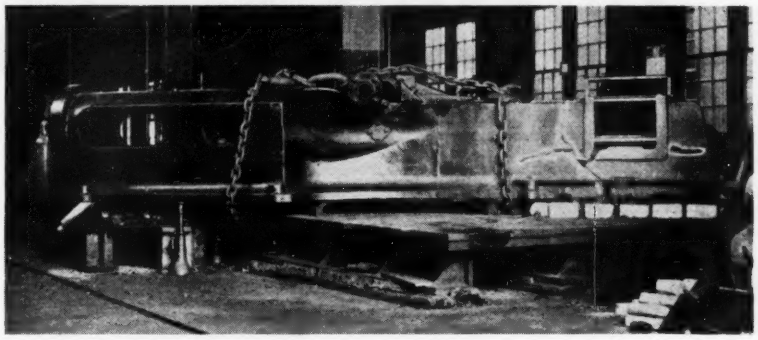


Fig. 1—Fractures in Engine Bed Chipped and Ready for Bronze Welding

Preheating was necessary because of the size of the casting. How this was accomplished is illustrated in Fig. 1. After two hours of preheating, three operators started the bronze welding. Sections of the chipped vee were heated 2 in. at a time by the blowpipe until sufficiently hot for pinning. Then followed the welding of that 2 in. section. This procedure was continued until all of the cracks were welded.

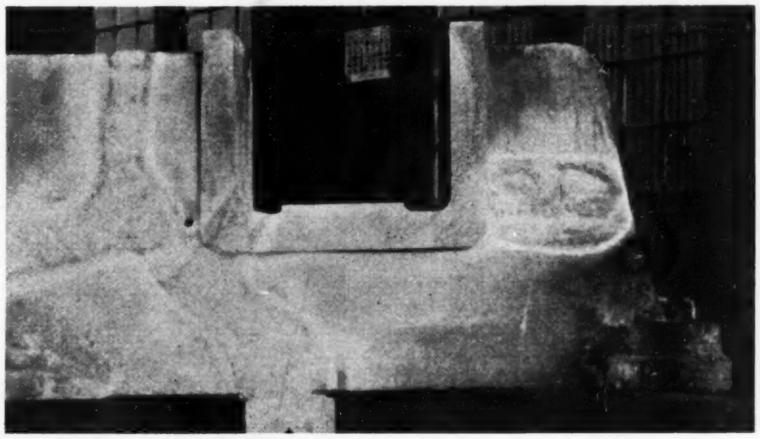


Fig. 2—Finished Bronze Welds on Front End of Engine Bed

The cast iron varied in thickness from $1\frac{1}{4}$ to 5 in. Altogether, there was about 28 lin.ft. of bronze welding, which required the use of 215 lb. of bronze welding rod. Actual welding took about 54 man-hours. The total cost of this repair, including all items, amounted to 20 per cent of the replacement cost of the casting.

Thermostat and Resistances Hold Even Temperature

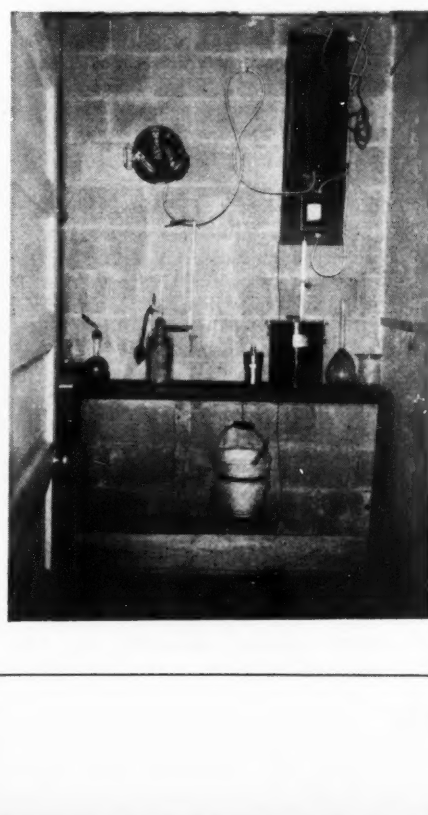
To provide a constant ambient temperature for making B.t.u. determinations with an oxygen bomb calorimeter, the laboratory of the Pittsburgh Terminal Coal Corporation at Mine No. 8, Coverdale, Pa., has been provided with an insulated calorimeter room containing automatic electric-heating and air-circulating equipment.

At the upper left in the illustration is a small electric fan in front of which are mounted three 600-watt resistance heater units. At the upper right is a pilot relay and magnetic breaker switch which are controlled by a Minneapolis-Honeywell thermostat of the ordinary dwelling-house type. The thermostat maintains the room temperature within a 2-deg. range by switching the fan and resistance units on and off.

The room dimensions are 7x7 ft. One side is the hollow-block wall of the building and the other three sides are partitions of composition board. These features, together with a low ceiling, make the room temperature respond quickly to the intermittent effect of the heating units.

On the bench under the magnetic switch is the calorimeter with the bomb of illium alloy standing just to the right of it.

Looking Through the Door Into the Calorimeter Room



WORD from the FIELD

Coal Men Undecided On Rate Action

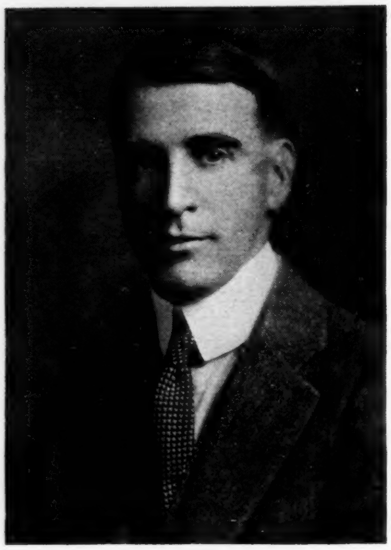
The next few days probably will determine the position to be taken by coal-trade associations on the petition of the railroads for a general 15 per cent increase in freight rates. A poll of the membership has been undertaken by the National Coal Association. A like canvass has been inaugurated among retailers by M. E. Robinson, Jr., president, National Retail Coal Merchants' Association. One of the most important operating groups already has registered informal protest against the proposed increase on coal.

When the question of an advance first was discussed, there were unofficial reports that coal might be excepted from the general increase. That any such exception is to be made, however, has been officially denied by the committee of railroad presidents handling the petition with the Interstate Commerce Commission. Base rates on coal, they say, will be advanced 15 per cent and existing differentials between competing fields preserved. In the event that, assuming the increase is granted, experience demonstrates any of the advances are injurious from a competitive standpoint, applications for reductions will be made. This promise is general and is not confined to coal traffic.

Proponents of the advance will be heard by the Commission beginning July 15; protestants will have their innings beginning Aug. 31.

Safety Awards Presented

Representatives of the companies which won the 1930 National Safety competition conducted by the U. S. Bureau of Mines were received by President Hoover on June 8 and later were guests at a luncheon of the National Press Club, Washington, D. C. A. B. Jessup, general manager of the Jeddo-Highland Coal Co., which operates the properties of Coxe Bros. & Co., appeared for the Tomhicken mine of the Coxe company, winner of the award in the anthracite group. The winning bituminous mine, Penn Central No. 1 of the Penn Central Light & Power Co., Saxton, Pa., was represented by J. H. Shearer, president. Each received a replica of the Sentinels of Safety trophy, presented by *The Explosives Engineer.*



Landon C. Bell

Bell Made Red Jacket Head

Landon C. Bell, Columbus, Ohio, has been elected chairman of the board of directors of the Red Jacket Consolidated Coal & Coke Co., Inc., coincident with his elevation to a similar office in the W. M. Ritter Lumber Co. organization, with which the Red Jacket company is affiliated. Mr. Bell succeeds W. M. Ritter. At the same time, E. E. Ritter and I. D. Cooke were elected vice-presidents. Mr. Ritter will continue as general manager of the Red Jacket company, while Mr. Cooke will retain his position as manager of sales.

Lincoln Heads Pocahontas Group

John J. Lincoln, vice-president, Crozer Coal & Coke Co., Elkhorn, W. Va., was elected president of the Pocahontas Operators' Association at the annual meeting held in June. Col. James Ellwood Jones, first vice-president, Pocahontas Fuel Co., Switchback, W. Va., was re-elected to the office of vice-president of the association, and Morris Watts, general manager, Arlington Coal & Coke Co., Bluefield, W. Va., was chosen treasurer, succeeding Mr. Lincoln. W. E. E. Koepler, Bluefield, was re-elected secretary.

New Plant Construction Active in June

New contracts for topworks and construction under way or completed at various coal operations for the month of June are as follows:

Buckeye Coal & Coke Co., Devils Fork, W. Va.; contract closed with Roberts & Schaefer Co. for Menzies hydroseparator equipment for washing and sizing egg, stove, and nut; capacity, 100 tons per hour; to be completed Aug. 1.

C. C. B. Smokeless Coal Co. will build a new tipple and coal washery at Glen White, W. Va. Contract has been let to the Fairmont Mining Machinery Co. for steel tipple and equipment, including shaker screens, lump and egg picking tables and loading booms, nut loading booms, five vibrating screens, conveyors, and miscellaneous equipment. Capacity of the tipple is 400 tons per hour. A separate contract has been let to the Koppers-Rheolaveur Co. for the coal-washing plant, to handle egg, stove, and nut. Capacity of the Rheolaveur plant will be 175 tons per hour. Tipple and washery will be completed Oct. 1.

Clover Fork Coal Co., Kitts, Ky.; contract closed with Roberts & Schaefer Co. for complete five-track, all-steel Marcus tipple equipped with automatic cagers and dumping equipment, Marcus picking table-screen, and loading booms; capacity, 250 tons per hour; to be completed Oct. 1.

Inland Steel Co., Wheelwright, Ky.; contract closed with the Link-Belt Co. for steel tipple and mine-car handling equipment. The tipple will be equipped with shaking screens, loading booms, and picking tables, and will have a capacity of 750 tons per hour. Date of completion is Dec. 1.

Lamar Colliery Co., Algonquin, W. Va.; contract closed with Roberts & Schaefer Co. for Menzies hydroseparator equipment for washing and sizing egg and nut; capacity, 100 tons per hour; to be completed Aug. 1.

Monroe Coal Mining Co., Revloc, Pa.; contract closed with the Fairmont Mining Machinery Co. for rescreening plant to produce $\frac{1}{4}$-in. slack; capacity, 100 tons per hour; to be completed July 15.

New River Co., Lochgelly, W. Va.; contract closed with the Interstate Equipment Co. for aerial tramway 2,000 ft. long to dispose of mine refuse;

capacity, 60 tons per hour; to be completed Aug. 1.

POND CREEK POCAHONTAS Co., Mine No. 3, Bartley, W. Va.; contract closed with Roberts & Schaefer Co. for Menzies hydroseparator equipment for washing and sizing stove, pea, and slack; capacity, 190 tons per hour; to be completed Sept. 15.

THREE FORKS COAL Co., Cassity, W. Va.; contract closed with the Fairmont Mining Machinery Co. for new tipple equipped with shaker screens, picking tables, loading booms, and conveyors to produce four sizes of coal; capacity, 150 tons per hour; to be completed July 31.

WEST VIRGINIA COAL & COKE CORPORATION, Rossmore, W. Va.; contract closed with the Interstate Equipment Co. for aerial tramway 1,000 ft. long to dispose of mine refuse; capacity, 30 tons per hour; to be installed Aug. 1.

Fairmont Operators Protest Proposed Coal Ban

A vigorous protest against the passage of any ordinances that would prohibit the use of bituminous coal for domestic fuel as a means of eliminating the so-called "smoke evil" was filed with the Clarksburg (W. Va.) City Council, June 20, by the Fairmont Coal Operators' Association. Calling attention to employment conditions in northern West Virginia, the protest contended that city governments in the region should not make them worse by passing restrictive legislation under pressure by natural gas and other interests. Any smoke nuisance could easily be remedied by the proper use of automatic equipment on stokers, it was asserted.

Peabody Mines Reopen

After a shutdown of a month for repairs, the Black Arrow mine of the Peabody Coal Co., West Frankfort, Ill., reopened on June 8, giving employment to about 650 miners. On the same day, the Harrisburg No. 43 mine of the company, Harrisburg, Ill., also reopened after a cessation in operations. The Harrisburg mine normally employs 400 men.

Coal and Coke Earnings Rise

Aside from aircraft, coal and coke was the only member of the general industrial group, as distinguished from utilities and railroads, to show an increase in net profits in the first quarter of 1931, as compared with the corresponding period in 1930. Earnings of six companies in the coal and coke group rose 285 per cent, according to figures compiled by the Standard Statistics Co., New York City. Coal mining companies alone paid $1,122,791 in dividends in May, Standard Statistics also reports. Total cash payments of domestic corporations in the same month were $229,608,425.

Miners' Unions Struggle for Supremacy, Strike Areas Extended in June

WESTERN Pennsylvania, eastern Ohio, and northern West Virginia were the areas most sharply affected by labor disturbances last month. In Pennsylvania and Ohio, the National Miners' Union—the Communist labor organization—was the leader in the strikes; in northern West Virginia, the forces of the United Mine Workers were in the ascendant. Late in the month local strikes condemned by the Lewis-Walker organization broke out in southern Illinois, where interests friendly with the Left Wing labor movement became active. Southern West Virginia was brought into the picture on July 6, when a third organization—the West Virginia Miners' Union—led by Frank Keeney, called a strike in Kanawha County.

The United Mine Workers gained a notable victory in the Pittsburgh district of western Pennsylvania on June 22, when, following a series of conferences presided over by Governor Pinchot, the Pittsburgh Terminal Coal Corporation, which parted company with the union in 1927, again signed a wage contract. A few days earlier, another company in the same district, the Creighton Fuel Co., also joined the union fold.

According to details made public by the union, the new agreement with the Pittsburgh Terminal company makes no change in existing machine rates at Mines 2, 3, 4, and 8, but increases the pick-mining rate from 55 to 60c. per ton. A uniform rate of $4.50 per day for skilled inside labor was established and the rate for common outside labor was increased from $3.50 to a minimum of $4. Rates to loaders on machine sections and to coal cutters at Mine 9 were increased 50 per cent and increases ranging from 50c. to $1.50 were made in day rates. The company also agreed to discuss business conditions and wage scales with the union every 90 days.

The Creighton contract, covering operations at the Tarentum mine, names rates of 58c. per ton for loading machine-cut coal, 75c. per ton for pick coal, and $4.80 per day for labor. The contract is subject to future readjustment on the basis of any general agreement which may be made for the field.

Union operation with a fixed wage scale is preferable to competition with wage-cutting, price-slashing operators, declared F. E. Taplin, chairman of the board of the Pittsburgh Terminal company, in a letter dated June 27 requesting constructive comments from "a few of those interested in the coal industry." Northern operators competing with their neighbors without definite wage scales, he continued, are in little different position than if they were all under a fixed scale and competing with non-union Southern operators. A policy of price and wage cutting, he said, fills the mines with Communists and is responsible for the rise of the National Miners' Union.

Progress of the strike in western Pennsylvania has had little effect upon total production, as the tonnage lost by mines closed down has been diverted to operations still running. There have been several clashes between the strikers and state and county peace officers. On June 22, one man was killed and several were injured in a battle between deputies and pickets who marched against the Wildwood mine of the Butler Consolidated Coal Co. in defiance of an injunction. The following day an attempt to stop trucks carrying workers to the Somers mine of the Pittsburgh Coal Co. resulted in the death of a storekeeper and the injury of four miners at Arnold City.

These attacks were charged to the activities of the National Miners' Union and its sympathizers. That organization made a great play of preventing the resumption of operations at the mines of the Pittsburgh Terminal Coal Corporation and the Creighton Fuel Co., but its attempts in that direction brought little success. Characterizing the calling of the Washington conference by Secretary Lamont on July 9 as government strikebreaking, Frank Borich, secretary of the National Miners' Union, and Vincent Kemenovich, secretary of the central rank-and-file strike committee, announced that a delegation of strikers would journey to Washington to denounce the meeting.

In northern West Virginia, the break

Denies Railroad Interference

Rumors that the Baltimore & Ohio R.R. was bringing pressure upon coal operators in northern West Virginia to prevent their entering into wage agreements with the United Mine Workers have been specifically denied by Daniel Willard, president of the railroad company, in a statement to *Coal Age*. The whispering campaign had alleged that certain operators had said that they would lose their fuel contracts if they signed up with the union and that one producer had had his contract canceled following such signing.

"There is no basis whatever for such a rumor," declared Mr. Willard. "While the Baltimore & Ohio is not directly interested in the actual mining of coal, it is very greatly interested in the welfare of the principal industry in northern West Virginia and earnestly hopes that some way may be found to compose the differences which seem to exist in certain regions at least between the operators and some of their employees. The Baltimore & Ohio does not intend in any way to interfere in a matter of this kind."

in non-union ranks started late in May when a number of operators in the Scotts Run field signed up with the United Mine Workers (*Coal Age*, Vol. 36, p. 339) was still further widened by the action of nearly thirty additional companies operating in Barbour, Harrison, Marion, Monongalia, and Taylor counties in entering into agreements with the union in June and early July. Employees at 23 other companies operating 31 mines, principally in Harrison, Taylor, and Barbour counties, however, continued on strike. No effort, apparently, was made by union officials to induce workers at Consolidation Coal Co., Bethlehem Mines Corporation, and the New England Fuel & Transportation Co. to walk out. The first violence in this section occurred on June 27, when mine guards at the Wendel operation of the Maryland Coal Co. of West Virginia fired several shots in beating off an attack by pickets.

Opposition of operators and United Mine Workers curbed the activities of the National Miners' Union in the Panhandle section. City and county officials prevented William Z. Foster, secretary, Trade Union Unity League (Communistic) from speaking at Moundsville, W. Va., last month. J. M. McQuade, president, Ben Franklin Coal Co. of West Virginia, met the challenge of the Communistic group by inviting the United Mine Workers to organize his mine at Panama.

During June, strikes were called at the mines of the Costanzo Coal Co., West Virginia - Pittsburgh Coal Co., Mineral States Coal Co., and Elm Grove Mining Co. of Ohio. Operations were resumed at the Mineral States mine on June 29 and a picket line was established by the United Mine Workers. Following an attack upon a train of taxicabs bringing strikebreakers, officials of the Elm Grove company, on July 1, requested a detachment of West Virginia militia to keep order.

The fact that the Kanawha County strike was called immediately following the Independence Day week-end made it difficult to estimate the initial effectiveness of the walkout ordered by the West Virginia union. On the second day of the strike, according to reports received by the Kanawha Coal Operators' Association, there were 10,922 men working and 1,796 absentees, as compared with 10,011 at work the preceding day and 1,786 absentees. The absentee lists included approximately 1,000 workers at three mines of the Paisley interests at Ward and the Taplin mine at Prenter. These four mines were down and it was reported that no attempt would be made to reopen Prenter in the near future.

Frank Keeney asserted that the strike was 82 per cent effective in 21 localities from which reports had been received at Charleston. He said that 4,109 men had struck at these 21 mines and that only 922 men were still at work. The state union also declared that one operator already had signified his willingness to negotiate with the Keeney group.

"Reports received from our district," retorted D. C. Kennedy, secretary of the operators' association, "show conclusively that the men have not responded to the strike call." Operators expressed the opinion that the Keeney union was being aided by the same Communistic elements active in Pennsylvania. Local officials of the United Mine Workers condemned the strike.

State police officials estimated that approximately 30 per cent of the miners in Boone County, 12 per cent in Kanawha County, and a few at scattered mines in Raleigh County had failed to report for work on July 6. There were no outbreaks of violence and little picketing at the start of the strike.

The drive of the Communist union in eastern Ohio started at the Dillon No. 6 mine of the Wheeling & Lake Erie Coal Mining Co. early in June and picketing spread rapidly to practically all Belmont and Jefferson County operations, despite opposition from adherents to the United Mine Workers. Clashes between picketing forces and peace officers were frequent. An attempt to storm the Belmont County jail to release imprisoned pickets led to the arrest of Leo Thompson and two other leaders of the National Miners' Union on the charge of criminal syndicalism.

Most of the eastern Ohio mines, however, continued operations with reduced forces, despite efforts of the strikers, which were directed principally against plants of the Wheeling & Lake Erie, Youghiogheny & Ohio, United States Coal, Rail & River, Clarkson, Big Five, Lorain Coal & Dock, Piney Fork, Wheeling Township, Nicholson, and Bainbridge Coal companies.

There was little disturbance in southern Ohio, although the United Mine Workers staged a series of mass meetings early in June. On June 16, 200 workers at the No. 5 mine of the Stalter & Essex Mining Co., at Hobson, struck for union recognition and a checkweighman. The company granted the request for the checkweighman, but refused union recognition. The men returned to work June 29 and walked out the next day, declaring that the pit committee had been discharged.

Frown Upon Joint Conference

Washington, D. C., July 9—Little good could be accomplished by a joint conference between operators and the United Mine Workers at this time, in the opinion of the majority of a small group of bituminous producers who met here today with Robert P. Lamont, Secretary of Commerce, and William N. Doak, Secretary of Labor. Doubt also was expressed that the executive arm of the government could do anything to improve the situation in the industry.

In announcing that no further conferences were contemplated, Secretary Lamont said that no effort had been made to reach any definite decisions on the various topics reviewed in the four hours' discussion between the operators and the Cabinet officers. "The object of the gathering," he stated, "was entirely that of eliciting a free and frank interchange of opinion and data. The bearing of freight rates on coal marketing, variance between scales of wages current in various parts of the country; status as to working arrangements, unemployment, and many other conditions in different coal mining districts were among the topics discussed.

"Many of the operators attending held the view that little could be accomplished of advantage to the public, the industry, or the workers engaged in it by the summoning of a national coal conference at this time. No final decisions were arrived at in regard to this matter."

Today's meeting was the result of an appeal made last month by the international executive board of the union requesting President Hoover to personally sponsor and convene such a conference "for the purpose of discussing the problems of the industry and finding a common basic understanding." Stating that the administration keenly desired to lend every possible assistance to any "constructive program" put forward by the industry, the President announced that he had referred the appeal to the Secretaries of Commerce and Labor and asked them to advise him of the present attitude of the industry on how "the government might contribute helpfully in any movement designed to advance the well-being of operators and mine workers."

The following operators attended the conference: C. E. Bockus, Clinchfield Coal Corporation; T. B. Davis and J. D. Francis, Island Creek Coal Co.; George B. Harrington, Chicago, Wilmington & Franklin Coal Co.; R. H. Knode, Stonega Coke & Coal Co.; F. R. Lyon and W. W. Stevenson, Consolidation Coal Co.; Eugene McAuliffe, Union Pacific Coal Co.; J. D. A. Morrow, Pittsburgh Coal Co.; C. F. Richardson, West Kentucky Coal Co.; Walter L. Robison, Youghiogheny & Ohio Coal Co.; Howard Showalter, Continental Coal Co.; P. M. Snyder, C. C. B. Smokeless Coal Co.; and F. E. Taplin, North American Coal Corporation.

Join U.M.W. Fold

Wage agreements with the United Mine Workers involving more than thirty companies operating in West Virginia and Pennsylvania have been reported during the past few weeks. The list of companies affected includes:

WESTERN PENNSYLVANIA

Creighton Fuel Co., Tarentum.
Pittsburgh Terminal Coal Corporation, Pittsburgh.

NORTHERN WEST VIRGINIA

Allied Coal Co., Shinnston.
Arnettsville Fuel Co., Arnettsville.
Bailey Coal Co., Flemington.
Gordon Bailey, Flemington.
Blocky Pittsburgh Coal Co., Flemington.
A. P. Brady Coal Co., Shinnston.
Brown Coal Co., Brownton.
Cambria Coal Co., Brownton.
Davis-Wilson Coal Co., Morgantown.
Fern Coal Co., Fern.
Gocke Coal Co., Lowesville.
Greer Gas Coal Co., Brownton.
Harry B. Coal Co., Monongah.
Hood Coal Co., Shinnston.
Hughes Coal Co., Meadowbrook.
Kelley Coal Co., Bingamon.
Martin Coal Co.
McKay Coal Co., Lowesville.
Pursglove Coal Mining Co., Pursglove.
Renwick Fuel Co., Flemington.
Roberts Coal Co., Haywood.
Rosedale Coal Co., Maidsville.
Sardis Coal Co., Dola.
Sesso Coal Co.
Shinnston Gas Coal Co., Shinnston.
Shriver Coal Co., Cassville.
Ten Mile Run Coal Co., Dola.
Tressler Coal Co., Brownton.

WEST VIRGINIA PANHANDLE

Ben Franklin Coal Co. of West Virginia, Moundsville.

The Buffalo & Susquehanna Coal & Coke Co. closed its Sagamore mine in central Pennsylvania, on June 19, when the miners struck for union recognition Efforts of the strikers to shut down the Sykesville operation, 50 miles away, were unsuccessful.

The Communist union has issued a call for a "national" conference of miners, including anthracite workers, at Pittsburgh July 15 and 16 to discuss extension of the work of the union, a six-hour day and a five-day week, and unemployment insurance. Representatives of the National Miners' Union were prominent in a conference of disaffected mine workers at Belleville, Ill., June 28, when plans were discussed for the formation of a new union at a meeting scheduled for July 6. The call for the July meeting was sent out by Frank Fussner, president of local union 34 of the Belleville subdistrict, who asserted that he and his associates represented the majority of the dues-paying members of the subdistrict.

Illinois operators met the issue of wildcat strikes and the agitation for a new union with a resolution, adopted June 24, in which the Illinois Coal Operators' Labor Association declared that it would recognize only the United Mine Workers and District 12 thereof under the terms of its present wage agreement. The wildcat strikes have hit the Orient mines of the Chicago, Wilmington & Franklin Coal Co., the No. 2 mine of the Wasson Coal Co. at Carrier Mills, and one mine of the Cosgrove-Meehan Coal Co. in Williamson County.

Strife between the United Mine Workers and cooperative mines in Indiana developed in June. Injunctions against union activities were sought by the Black Diamond Coal Co.. at Dugger, and the Somerville Coal Corporation, at Somerville. A clash between union miners and employees at the Liberty cooperative mine, at Buckskin, resulted in injuries to seventeen men.

Charges that the Colorado Fuel & Iron Co. had cut wages in the Crested Butte section without notice to the Colorado State Industrial Commission and a ruling by the Attorney General of the state that the Commission was without jurisdiction in cases where miners accepted reductions voluntarily were the outstanding June developments in the Colorado situation. Complaint also was made by four men employed at the Frederick mine of the Colorado Fuel & Iron Co. that rates on yardage in entries and crosscuts had been reduced without notice. The Commission on June 9 decided to make a field investigation at the Crested Butte mines.

Following the Attorney General's ruling, the Commission of June 17 relinquished jurisdiction over the wage cuts made by the Colorado Springs Co., Pikes Peak Fuel Co., Corley Coal Co., Columbine Anthracite Co., Mutual Coal Co., Huerfano Coal Co., and the Deldosso Coal Co. At the same time, it announced that it was unalterably opposed to wage reductions.

Net Ton Legal for Anthracite

Sales of anthracite coal in Pennsylvania on the net ton basis were legalized for the future on June 25, when Governor Pinchot signed a bill passed by the last legislature doing away with the old gross ton of many years' standing. While most of the dealers in the state have been selling by the unit of 2,000 lb., they were prohibited by law from calling it a ton. The producing companies followed the lead of the dealers on April 1, adopting the net ton as the unit of sales and quotations. Freight charges, however, are still collected on the ton of 2,240 lb.

"Pocahontas" Injunction Upheld

Action of the U. S. District Court at Indianapolis, Ind., in granting an injunction to restrain certain coal dealers and jobbers in that city from substituting other coals for "Pocahontas" and from using the name "Pocahontas" in connection with coal not produced in the Pocahontas field was upheld by the Circuit Court of Appeals for the Seventh Circuit late last month. The case was instituted nearly two years ago by the Pocahontas Operators' Association.

Transportation Code Approved

American Standards Association has approved a safety code for coal-mine transportation prepared by the coal-mining branch, national standardization division, American Mining Congress, under the chairmanship of Fred Norman, chief engineer, Allegheny River Mining Co., Kittanning, Pa. The standard is in two parts, covering installation and operation of mine transportation equipment.

The section relating to installation covers material and workmanship in constructing mine tracks; bonding; stop blocks and derails on grades; switches; derailers on slopes and safety blocks; signal systems governing the various classes of haulage; construction and placing of shaft and slope hoists; and safety features for bumpers, brakes, couplings, and bodies of mine cars. The operation part of the standard covers safety in the use of transportation equipment, including gathering haulage; rope haulageways in shafts and slopes; locomotives; man trips; hauling explosives; and inspection of equipment.

Truax-Traer Earnings

Truax-Traer Coal Co. and subsidiaries report, for the year ended April 30, 1931, net profits of $347,508 after depreciation, depletion, interest charges, and federal and state taxes, equivalent to $1.25 per share on the 276,325 shares of stock outstanding.

O'Gara to Ship by Water

The O'Gara Coal Co., Chicago, will begin the shipment of coal from Illinois to the Twin Cities via the federal barge line along the Mississippi River in August. Decision to ship followed an agreement with city officials, and the O'Gara company expects to supply 35,000 to 40,000 tons this season and 100,000 or more tons in 1932. The coal will be loaded at East St. Louis, Ill.

Permissible Plates Issued

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines in May, as follows:

(1) Goodman Mfg. Co.; Type 148-K3 power shovel; 35-hp. motor, 220 volts, a.c.; Approval 222; May 8.

(2) Goodman Mfg. Co.; Type 312-EL3 shortwall mining machine; 50-hp. motor, 220-500 volts, d.c.; Approvals 223 and 223-A; May 13.

Approval 1500, issued to the Geo. D. Whitcomb Co., March 14, 1921, was rescinded for cause May 12, 1931, but without prejudice to the successor company, the Whitcomb Locomotive Co.

Milton E. Robinson, Jr.

Robinson Again Heads Retailers

Milton E. Robinson, Jr., vice-president of the M. E. Robinson Coal Co., Chicago, was re-elected to his fourth term as president of the National Retail Coal Merchants' Association at the conclusion of the annual meeting in Baltimore, Md., last month. Fenton M. Fadeley, Jr., Washington, D. C., was chosen vice-president for the coming year, and Maurice J. Crean, Philadelphia, Pa., was re-elected treasurer.

Orders Foreclosure Sale

Sale of the properties of the Franklin County Coal Co., operating in southern Illinois, has been ordered by the U. S. District Court at East St. Louis, Mo., on foreclosure proceedings instituted by the Pennsylvania Co. for Insurances on Lives and Granting Annuities, trustee for bondholders on a mortgage issued in 1924. The coal company is alleged to have defaulted on interest payments and bond retirements this year in the sum of $1,991,039. No date has been fixed for the sale.

Cresson Meet Held

The team from No. 14 mine of the Pennsylvania Coal & Coke Corporation, Nanty-Glo., Pa., won first honors in the annual first-aid meet, held at Cresson, Pa., late in June. Mine No. 42, Arcadia, took second place, while Mine No. 55, Alverda, walked away with third honors.

Truax-Traer Changes

W. H. Cunningham has been made chairman of the executive committee of the Truax-Traer Coal Co., Chicago. A. H. Truax, formerly vice-president in charge of operations, succeeds Mr. Cunningham. L. S. Killen, former purchasing agent, and J. O. Westlund have been made vice-presidents.

Form Coal Credit Organization

Climaxing a series of meetings in past months, the credit movement launched by the commercial research section of the National Coal Association was definitely organized on June 11 at a meeting in Cincinnati, Ohio, attended by representatives of practically all the producing fields east of the Mississippi. A constitution for the National Coal Credit Corporation, incorporated in Ohio a short time ago, was adopted, and officer and directors were elected.

W. J. Magee, vice-president of the Carbon Fuel Co., Cincinnati, was chosen president. E. H. Jaynes, assistant secretary, Cleveland Cliffs Iron Co., Cleveland, Ohio, was chosen vice-president, and L. C. Percival, Cincinnati, general manager of sales, Island Creek Coal Co., was elected treasurer. Sixteen of the 21 directors provided for in the constitution also were elected at the meeting, and five will be chosen later.

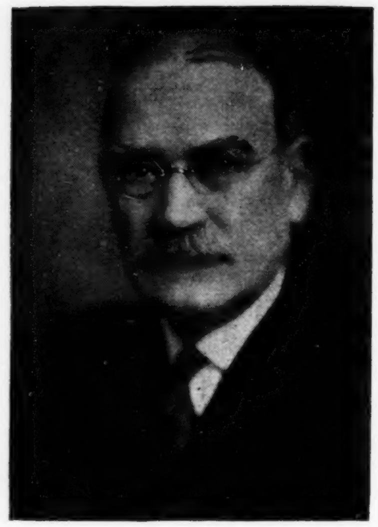
At the meeting of the board of directors, held after the election, Forrest C. Respass, Cincinnati, Ohio, for several years director of the Bureau of Coal Statistics, was named executive secretary, effective July 1. Stuart R. Ducker, Cincinnati, Ohio, counsel for the corporation, was chosen on June 26 to head the collection department. On June 18, M. W. Stark, formerly vice-president of the Red Jacket Consolidated Coal & Coke Co., was engaged by the executive committee to cooperate with Mr. Respass in getting the work of the corporation under way.

Mine Consolidation Asked

Consolidation of all the coal mines east of the Mississippi River to bring about a complete recovery of the coal industry was advocated by Senator James J. Davis, of Pennsylvania, in an address at Greenville, Pa., June 18. Such a consolidation, he asserted, would remove the "artificial freight differentials" which discriminate against producers in Pennsylvania and aid Southern mines. Senator Davis was of the opinion that changes in the law would not be necessary to permit the consolidation, but stated that the law which permitted the "unfair differential" must be revised.

Tax Elimination Approved

The Senate finance and taxation committee of the Alabama Legislature has reported favorably on the West bills for the gradual elimination of tonnage taxes on coal and iron ore. Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co., Birmingham, was the only spokesman before the committee, and charged that for twelve years the coal and iron industry has suffered greatly as a result of the tonnage levies, which, he said, amount to "double and unfair taxation."



The Late Col. W. M. Wiley

Colonel Wiley Dies

Col. W. M. Wiley, vice-president and general manager of the Boone County Coal Corporation, was fatally stricken at Sharples, W. Va., June 26, while attending the funeral of his wife, who had died the preceding Wednesday. Colonel Wiley was 67 years old. His connection with the coal industry dated from 1912, when he first went to West Virginia from Colorado. In 1918, he joined the Boone County staff, assuming the positions he held at the time of his death. Colonel Wiley also was vice-president for the southeastern division of the Chamber of Commerce of the United States and a past president of the Kanawha Coal Operators' Association.

Personal Notes

A. C. Fieldner, chief chemist, Experiment Stations Division, U. S. Bureau of Mines, Washington, D. C., has been awarded the Lamme Meritorious Achievement Medal by the Ohio State University. This award is made to graduates of the university for meritorious achievement in the engineering or technical arts.

T. E. Jenkins, vice-president in charge of operations, West Kentucky Coal Co., Sturgis, Ky., has resigned after nineteen years of service with the company. Mr. Jenkins has not announced his plans for the future.

E. J. Devlin, Springfield, Ill., has been made general manager of the Macon County Coal Co., Decatur, Ill., succeeding David W. Beggs. Mr. Devlin's connection with the coal industry extends over 42 years. He started as a trapper at the age of twelve, and was state mine inspector before going with the Macon County company.

Edwin C. Wade has been elected president of the Monarch Smokeless Coal Co., Mohegan, W. Va., vice the late Capt. D. H. Barger, of Shawsville, Va.

Union Pacific Old Timers Celebrate in June; Hold Seventh Reunion at Rock Springs

ALL roads crossed at Rock Springs, Wyo., on June 13, when the Union Pacific Coal Co. Old Timers' Association again gathered to the familiar tunes of skirling pipes and brass bands to celebrate the seventh annual reunion of the organization, grown from 283 members in 1926 to 521 in 1931. James Moon, 57 years with the company, was on hand to renew acquaintances with Peter Boam, Sr., T. H. Butler, T. M. LaMarr, Wm. Bean, Sr., and Lao Chee, his fellow Old Timers in the 50-year class, and to welcome eight new additions to the 40-year rank, swelling the total to 34.

The ceremonies at the Old Timers' reunion were preceded by the annual first-aid field day of the Union Pacific and Washington Union coal companies on June 12, when employees of the two companies and their sons and daughters settled the question of supremacy in first aid for the coming year. Making it two straight, the Tono (Wash.) team of the Washington Union company, captained by Fred Pontin, captured first honors in the competition for men's teams. Second place went to the Hanna (Wyo.) team captained by Thos. Lucas, while third honors were carried off by the Winton (Wyo.) team, under the leadership of Andrew Strannigan.

Eugene McAuliffe, president of the Union Pacific company, was the principal speaker at the annual Old Timers' business meeting, at which Joseph McTee, Sr., Rock Springs, was elected president for the coming year. Other officers chosen were: vice-president, J. S. Preece, Rock Springs; secretary, A. G. Hood, Superior; and treasurer, A. H. Doane, Rock Springs. The board of governors for the coming year will be composed of the following: Geo. Crank, Hanna; D. M. Jenkins, Winton; O. C. Buehler, Hanna; E. C. Way, Tono; and J. M. McClennan, Superior.

After touching on the necessity for cooperation in securing safety results, Mr. McAuliffe discussed labor troubles in western Pennsylvania, eastern Ohio, and West Virginia, drawing the conclusion that the methods of organized labor, no less than the shortsightedness of the operators, have contributed to the present depressed state of the industry. "There is both necessity and justification for union organization, but union organization, like corporate organization, has no justifiable place in American life unless the men who undertake to manage it are capable of vision, high moral courage, and unimpeachable integrity.

"I do not believe the mine workers' union, as administered, will be able to sell itself back to the industry. More recently, I have wondered if some new basis of control could not be established. For example, the management of the union might be taken over by three men, one of whom would be selected from the membership, the second by the organized coal industry, the third—and deciding member—to be appointed by the President of the United States, this board or commission to be committed to a reasonable and proper wage and a program of efficiency, the personal safety and welfare of the men employed in the industry to be given paramount attention. With a full publication of rates of pay and working conditions, whether high or low, that portion of the industry that desires to maintain a living wage would find the full force of public opinion behind it."

Following the business meeting, the Old Timers formed up for their annual parade to the banquet in the Old Timers' Building, where Mr. McAuliffe presented gold buttons to Jack Glad, Benjamin Lewis, Joseph McTee, James Gennetti, Bonifacio Dona, John E. Jones, James Zuick, and Nels Eckman, the new members of the 40-year class. As in past years, Mrs. McAuliffe pinned the buttons on all but Mr. Eckman, who was detained at his home because of sickness.

Ends Coal and Iron Police

Pennsylvania's Coal and Iron Police passed out of existence on June 30 when Governor Pinchot, in accordance with his campaign promises, revoked the commissions of all the members. Guards hereafter employed by industrial concerns, including coal-mining companies, will have no authority outside of the companies' property.

Explosives Approved

Two additions to the active list of permissible explosives were made by the U. S. Bureau of Mines in May, as follows:

(1) Liberty Explosives Corporation, Liberty No. 2; volume of poisonous gases, less than 53 liters; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of $1\frac{1}{4}$x8-in. cartridge, 134 grams; smallest permissible diameter, 1 in.; unit deflective charge, 223 grams; rate of detonation of $1\frac{1}{4}$-in. diameter cartridge, 11,250 ft. per sec.

(2) Liberty Explosives Corporation, Liberty-Gel., L. F.; volume of poisonous gases, less than 53 liters; characteristic ingredient, nitroglycerin gelatinized with nitrocotton; weight of $1\frac{1}{4}$x8-in. cartridge, 226 grams; smallest permissible diameter, $1\frac{1}{4}$ in.; unit deflective charge, 261 grams; rate of detonation of $1\frac{1}{4}$-in. diameter cartridge, 13,940 ft. per sec.

T. H. Butler
Newly elected president, Rocky Mountain Coal Mining Institute

Brier Hill Wins Tax Case

Cost of items of plant and equipment necessary to maintain production may be charged to current expenses in reporting income for tax purposes, according to a decision handed down last month by the Circuit Court of Appeals for the Sixth Circuit in the *Brier Hill Collieries* case. The case was argued on Jan. 13, the National Coal Association and fourteen local associations intervening, as *amici curiae*, in favor of the Brier Hill company. The decision in the Brier Hill case follows similar decisions in the Fourth and Fifth Circuits in the *Marsh Fork* and *Roden Coal* company cases, leaving the Commissioner of Internal Revenue with the problem of either accepting the theory laid down in the decisions or appealing to the Supreme Court.

Moriarty Heads Cabin Creek

C. R. Moriarty and M. L. Patton, both of Cincinnati, Ohio, have been elected president and vice-president, respectively, of the Cabin Creek Consolidated Coal Co., operating at Kayford, W. Va. Mr. Moriarty, formerly vice-president and sales manager of the company, succeeds Josiah Keely, who retired late in 1929. Mr. Patton was formerly sales manager for the Truax-Traer Coal Co.

Western Operators Elect

H. H. Bubb, general superintendent, Cokedale (Colo.) plant of the American Smelting & Refining Co., was elected president of the Colorado & New Mexico Coal Operators' Association at the annual meeting held last month. Douglas Millard, manager, fuel sales, Colorado Fuel & Iron Co., Denver, Colo., was chosen vice-president, and F. O. Sandstrom, Denver, was re-elected to the office of secretary.

Management of Smaller Plants Subject of Conference

A special conference on successful management for the 98 per cent of American industrial plants that employ less than 500 men will be a feature of the meetings of the Industrial Institute, to be held at Silver Bay-on-Lake George, N. Y., Aug. 10-25. At the sessions devoted to the smaller industries, which run from Aug. 10 to Aug. 15, representatives of these industries charged with plant operation and policy-making responsibilities will lead the discussion on production, personnel, and other problems.

Industrial Notes

AMERICAN ASKANIA CORPORATION, optical and industrial instruments, has opened an office and service depot at 1603 South Michigan Ave., Chicago.

D. J. QUAMMEN, connected with the Philadelphia (Pa.) office of Cutler-Hammer, Inc., for five years as a sales engineer, has been made district manager. Mr. Quammen succeeds F. J. BURD, who has been made assistant manager of the Chicago office of the company in charge of industrial sales in the district.

JOSEPH ESHELMAN, Birmingham, Ala., has been appointed sales representative of the Northern Equipment Co., Erie, Pa., and will handle feed water regulators, pump governors, differential valves, and similar equipment in eastern Tennessee.

JOSEPH T. RYERSON & SON, INC., Chicago, following an initial purchase of the interest of W. J. Reed and others in the Reed-Smith Co., Milwaukee, Wis., in 1924, have bought the remaining stock and the firm becomes the Reed-Smith plant of Joseph T. Ryerson & Son of Wisconsin.

LUKENWELD, INC., designer and manufacturer of parts of machinery and equipment by gas cutting, forming, and arc welding of rolled steel, has appointed W. R. McDonough & Co. as its representatives in the Cleveland (Ohio) district, and the Dravo Doyle Co. as its representative in the Pittsburgh (Pa.) district.

HERCULES POWDER CO., Wilmington, Del., will transfer its explosives manufacturing operations from the Emporium (Pa.) plant to the Kenvil (N. J.) works. While many of the Emporium employees will be transferred to the new location, manufacturing facilities will be maintained for possible future use.

DAVID GEISSINGER, formerly representative in Pittsburgh, Pa., for several machine tool manufacturers, has joined the staff of the Fort Pitt Steel Castings Co., McKeesport, Pa., as special representative.

GOULDS PUMPS, INC., Seneca Falls, N. Y., has made several changes in its headquarters and branch staffs. Names of the men and the new positions they will occupy at headquarters are: HENRY L. BOYER, manager, farm-suburban sales; HENRY F. MILLER, manager of industrial sales; W. G. ALLEN, manager of engineering sales; J. B. ANDERSON, department of inquiry and estimate; G. W. CRAMER, advertising manager. J. B. FOLEY has been transferred as manager from the Pittsburgh (Pa.) office to the Chicago office, while FRED JONES, formerly manager of the Philadelphia (Pa.) office has assumed the same position at Pittsburgh. MARK D. ROWE, Servel Sales, Inc., has been made manager of the New York City office. The Goulds company has opened a branch office in Dallas, Texas, to serve the Southwest.

CEMENT-GUN CONSTRUCTION CO., Chicago, has moved its New York City office to the Woolworth Building.

E. A. THUMLERT, lately with the Palmer-Bee Co., Detroit, Mich., has joined the sales staff of the Fairfield Engineering Co., Marion, Ohio, and will specialize in skip hoists and ash hoppers and grates.

Coming Meetings

Mining Society of Nova Scotia; annual meeting, July 14-16, Nova Scotian Hotel, Halifax, N. S.

International Railway Fuel Association; annual meeting, Sept. 15 and 16, Hotel Sherman, Chicago.

Coal Division, American Institute of Mining and Metallurgical Engineers; Oct. 9-10, Bluefield, W. Va.

International Conference on Bituminous Coal; Nov. 16-21, Pittsburgh, Pa.

Obituary

HARRY L. CARR, 40, superintendent of the Maidsville (W. Va.) mine of the Kellys Creek Colliery Co., was instantly killed June 27 in an automobile crash near Wheeling, W. Va.

WILLIAM JONES, 61, superintendent of the White Horse Coal Co. mine at Flemington, W. Va., died June 26 at a Clarksburg (W. Va.) hospital after a long illness. Mr. Jones was connected with coal mining in northern West Virginia for nearly a score of years prior to his death.

SIR HUGH BELL, one of the great industrial figures of the North of England, died at London, June 29, at the age of 87. As both a colliery owner and an ironmaster, Sir Hugh was vice-chairman of Dorman Long & Co.; chairman of Horden Collieries, Ltd., and Pearson & Dorman Long, Ltd.; and a director of the London & North Eastern Railway Co. and the Yorkshire Insurance Co.

WILLIAM LAWRENCE SAUNDERS, 74, chairman of the board of directors of the Ingersoll-Rand Co., died June 25, at Teneriffe, in the Canary Islands. Mr. Saunders early in life invented the widely used drilling equipment employing the tube and water jet, and brought out many other improvements in drilling machinery after going with Ingersoll-Rand in 1882. Mr. Saunders founded the award of the American Institute of Mining and Metallurgical Engineers which bears his name.

King Coal's Calendar for June

June 5—American Society of Heating and Ventilating Engineers and the Stoker Manufacturers' Association are admitted to full membership in the Committee of Ten—Coal and Heating Industries by unanimous vote.

June 8—Two hundred men employed at the Dillon No. 6 mine of the Wheeling & Lake Erie Coal Co., Laferty, Ohio, walk out in response to a strike call issued by the National Miners' Union, initiating a stoppage which rapidly spreads to the majority of mines in Jefferson and Belmont counties, and into the West Virginia Panhandle.

June 11—John L. Lewis, acting for the executive board of the United Mine Workers, transmits to President Hoover a request that the White House sponsor and aid, "to the fullest extent possible," a conference of representatives of the coal operators and miners "for the purpose of mutually discussing the problems of the industry and finding a common basic understanding." Many coal operators, the message said, have given assurance that they would attend such a meeting if the government would issue a call.

June 11—Definite organization of the National Coal Credit Corporation, which grew out of a credit movement launched by the commercial research section of the National Coal Association, is completed at a meeting in Cincinnati, Ohio. W. J. Magee, vice-president, Carbon Fuel Co., is elected president, and a constitution is adopted.

June 12 — Fifteen representatives of the coal and heating-equipment industries in Omaha, Neb., complete the tentative organization of The Better Heating Association of Greater Omaha, formed to cooperate with the Committee of Ten—Coal and Heating Industries.

June 18 — The International Labor Conference of the League of Nations, meeting at Geneva, Switzerland, adopts a convention fixing the maximum day in coal mines at 7¾ hr.

June 20—Official arbitration court, sitting at Essen, Germany, rejects demands of Ruhr coal operators for a 10 per cent wage reduction. Under the award, present wage rates will be continued until Sept. 20.

June 22 — Pittsburgh Terminal Coal Corporation, operating in the western Pennsylvania field, signs an agreement with the United Mine Workers of America including the following provisions: retention of old wage rate for machine loading and cutting; increase in the pick-mining rate from 55 to 60c. per ton; establishment of a basic day wage for inside skilled labor of $4.50; increase in the rate for outside labor from $3.50 to $4 per day. The company also agreed to allow the election of checkweighmen.

June 30—President Hoover, replying to a request for a conference between coal operators and miners made by the executive board of the United Mine Workers on June 11, informs John L. Lewis, international president, that he has called the attention of the Secretaries of Commerce and Labor to the situation in the bituminous industry, with the request that they advise him "as to the manner in which the government might contribute helpfully in any movement designed to advance the well-being of operators and mine workers, as well as all others interested in the bituminous coal situation."

Coal Mine Accidents Kill 105 Men in May; Fatality Rate Falls

ACCIDENTS in the coal mines of the United States during the month of May, 1931, caused the death of 105 men, according to reports received from state mine inspectors by the U. S. Bureau of Mines. This was a reduction of 16 from the 121 fatalities reported for the preceding month and a reduction of 43 from the 148 deaths which occurred in May, 1930. While the production of coal in May declined 3 per cent from the April output, the number of deaths was reduced 13 per cent. Comparing May, 1931, with the same month last year, the number of deaths decreased 29 per cent, while production of coal decreased only 20 per cent. There were 33,319,000 tons of coal mined in May of the present year, as compared with 34,178,000 tons in April, 1931, and 41,865,000 tons in May, 1930. The death rates based on these figures were 3.15 per million tons of coal produced during May of the current year, as compared with 3.54 during the preceding month and 3.54 for May, a year ago.

Considering bituminous mines alone, a lower death rate was shown in May, 1931, than in either the corresponding month last year or in April of the present year, the rate being 2.44 per million tons, based on 69 deaths and 28,314,000 tons, as compared with 3.17 a year ago, based on 114 deaths and 35,954,000 tons; and 2.74 for April, 1931, based on 78 fatalities and 28,478,-000 tons.

The anthracite mines in Pennsylvania had a death rate of 7.19 per million tons of coal in May, 1931, as compared with 5.75 for May a year ago and 7.54 for April, 1931. These rates were based on 36 deaths and 5,005,000 tons in May of the present year; 43 deaths and 5,700,000 tons in April, 1931; and 34 fatalities and 5,911,000 tons in May, a year ago.

During the first five months of the current year, 634 lives were lost in the mining of 187,610,000 tons of coal in the United States. This indicates a death rate of 3.38 per million tons, an improvement over the record of a year ago, when 877 men were killed and 225,358,000 tons of coal was produced, with a death rate of 3.89. Separated into bituminous and anthracite, the records for the first five months of 1931 were 2.78 and 6.93, respectively, for bituminous and anthracite mines, whereas those for the corresponding period in 1930 were 3.50 and 6.61, respectively.

One major disaster—that is, a disaster in which five or more lives were lost—occurred during May of the present year. This was an explosion at Mt. Carmel, Pa., which resulted in five deaths. The period from January to May, 1931, showed four major disasters which resulted in the loss of 46 lives. For the same period in 1930, there were seven major disasters and 88 deaths. Based exclusively on these disasters, the death rates were 0.245 for 1931 and 0.390 for 1930. The major disasters thus far in 1931 occurred at the rate of 2.13 separate disasters (as distinguished from the number of deaths resulting from the disasters for each hundred million tons of coal mined, as compared with 3.11 for the corresponding period in 1930.

Comparing the accident record for the first five months of 1931 with that for 1930, a reduction is noted in the death rates from falls of roof and coal, haulage, gas or dust explosions, explosives, and electricity, which are the principal causes of fatalities in coal mines. The comparative rates are as follows:

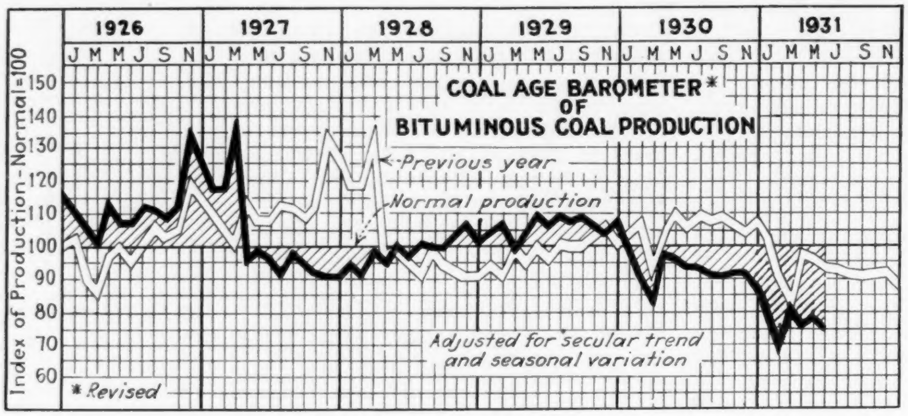
Cause	1930 Fatalities	1930 Rate	January-May, 1930 Fatalities	January-May, 1930 Rate	January-May, 1931 Fatalities	January-May, 1931 Rate
All causes	2,014	3.798	877	3.892	634	3.379
Falls of roof and coal	1,067	2.012	462	2.050	355	1.892
Haulage	303	.572	146	.648	106	.565
Gas or dust explosions:						
Local explosions	61	.115	34	.151	5	.027
Major explosions	214	.404	85	.377	46	.245
Explosives	78	.147	31	.137	21	.112
Electricity	76	.143	33	.147	22	.117
Miscellaneous	215	.405	86	.382	79	.421

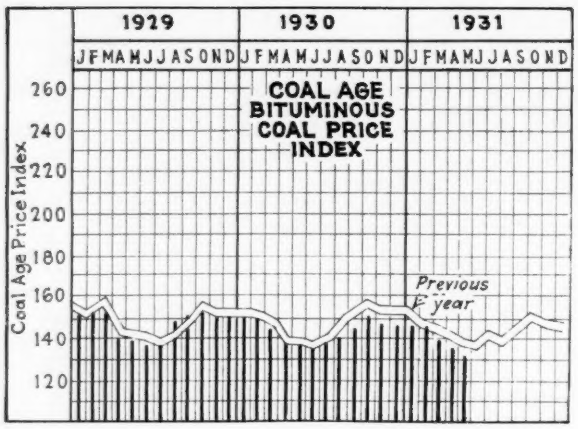
Coal-Mine Fatalities During May, 1931, by Causes and States

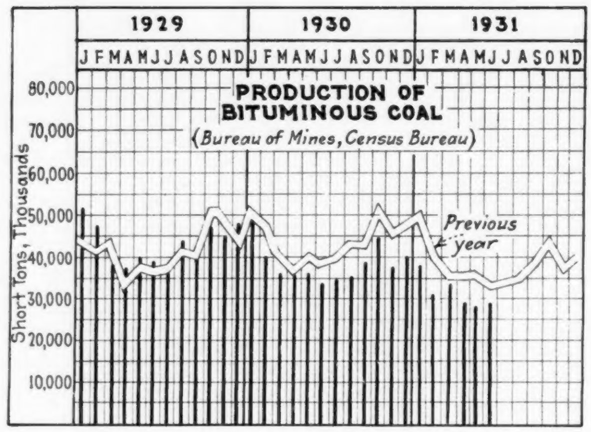
(Compiled by Bureau of Mines and published by *Coal Age*)

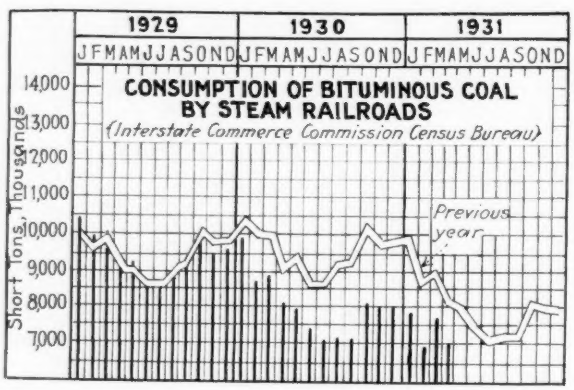
State	Underground: Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Shaft: Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Surface: Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	Total by States: 1931	1930
Alabama			2									2													2	3
Alaska																									0	0
Arkansas																									0	0
Colorado	1											1													1	4
Illinois	7		1									8													8	11
Indiana	1		1									2													2	0
Iowa	1	1					1					3													3	1
Kansas																									0	0
Kentucky	6						1					7													7	17
Maryland		1										1													1	1
Michigan																									0	0
Missouri																									0	1
Montana																									0	0
New Mexico	1											1													1	1
North Dakota																									0	1
Ohio	2		1									3													3	9
Oklahoma																									0	1
Pennsylvania (bituminous)	6		5									11										1		1	12	31
South Dakota																									0	0
Tennessee	4											4													4	3
Texas																									0	0
Utah																									0	0
Virginia																									0	1
Washington			1				1					2													2	0
West Virginia	7	5	4		1		2					19						2	1				1	4	23	28
Wyoming																									0	1
Total (bituminous)	36	7	15		1		5					64						2	1			1	1	5	69	114
Pennsylvania (anthracite)	13	4	5	5	4	1					2	34						1				1		2	36	34
Total, May, 1931	49	11	20	5	5	1	5				2	98						3	1			2	1	7	105	
Total, May, 1930	73	13	29	4	4	3	5				5	136			1	1	2		2			2	6	10		148

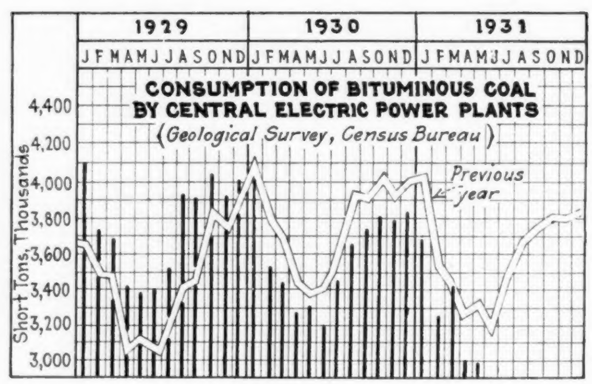
Indicators of Activities in the Coal Industry

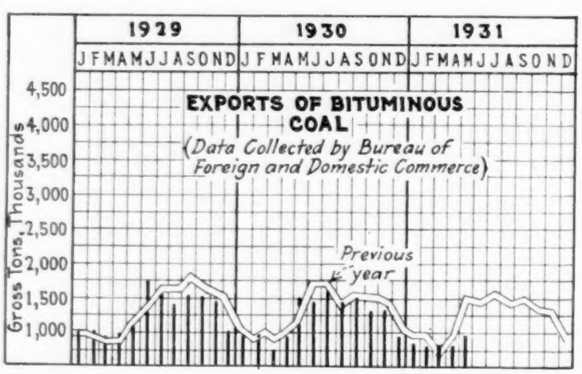


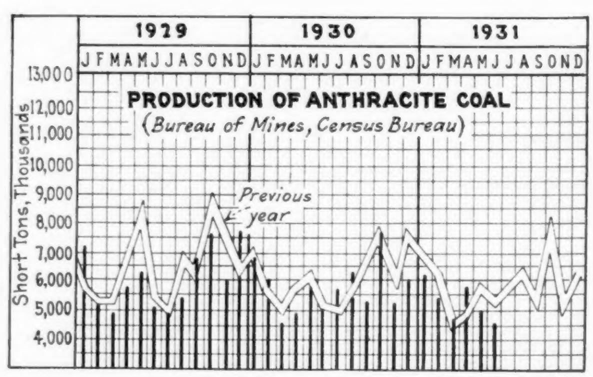












MARKETS

in Review

WHILE quietness was the ruling characteristic in most of the bituminous coal markets of the country in June, improved business, largely in domestic sizes, was noticeable in a few of the larger trading centers. In general, however, demand for both domestic and steam sizes was slow. As in past months, curtailed production reduced the visible supply of slack and screenings, with the result that quotations held their usual strong position until the end of the month, when a slight tendency toward weakness became apparent. Labor difficulties in western Pennsylvania, eastern Ohio, and northern West Virginia failed to cause any material curtailment in production in those areas, and buyers in general were unmoved by any fear of prolonged stoppages.

Summer dullness closed down on the anthracite markets of the country in June. Consumer indifference militated against any real dealer buying, though stove moved well in all localities. Egg and chestnut were in fair demand in some markets, but were ignored in others. Pea and buckwheat ran up against opposition because of the relatively higher 1931 prices, and this attitude on the part of the consumer was reflected in small surpluses at the mines for the first time in some months. Rice was in good supply during the month, while the weakness in barley continued.

June production of bituminous coal is estimated by the U. S. Bureau of Mines at 29,165,000 net tons, an increase of 851,000 tons over the May output of 28,314,000 tons, but a drop of 4,549,000 tons from the June, 1930, total of 33,714,000 tons. Anthracite production is estimated at 4,552,000 net tons for June. This compares with 5,005,000 tons in May, and 5,090,000 tons in June, 1930.

Coal Age Index of spot bituminous prices (preliminary) was: 130, June 6; 128, June 13; and 129, June 20 and 27. The corresponding weighted average prices were: \$1.57, June 6; \$1.55, June 13; and \$1.56, June 20 and 27. Revised Index figures for May were: 133, May 2; and 132, May 9, 16, 23, and 30. Corresponding weighted average prices were: \$1.61, May 2; and \$1.60, May 9, 16, 23, and 30. The monthly index for May was 132⅓, as compared with the unrevised figure of 129 for June.

Shipments to the lower Lake ports rose in June to about 70 per cent of the June, 1930, rate. For the season to June 29, dumpings were as follows: cargo, 8,293,371 tons; fuel, 256,726 tons; total, 8,550,097 tons. In the same period in 1930, dumpings were: cargo, 13,368,385 tons; fuel, 445,927 tons; total, 13,814,312 tons. Lake buyers, however, insisted on cuts of 10 to 20c.

PRICES on secondary grades of Illinois and Indiana screenings slumped in the Chicago market in June, in spite of an abnormally low demand for domestic sizes. Large buyers were able to make purchases as low as 60c., while quotations in general were down 15c. from the preceding month. Prime grades of screenings from southern Illinois and Indiana No. 4 fields were held firmly by standard shippers, though independents sought business at 25 to 50c. below circular.

Domestic sizes were extremely slow, and practically every Middle Western mine carried a surplus of "no bills." Some operators were forced to ship lump on steam contracts in order to secure running time for other commitments. Dealers refused to take coal on contracts in spite of urgent persuasion. Hot weather and poor credit conditions were blamed for this stand-off tendency. Undisturbed by the slow market, southern Illinois producers announced an advance of 25c. on lump and 15c. on egg for July. Domestic prices in other Middle Western fields were unchanged, with western Kentucky producers scouting at business at \$1 and up, in spite of low levels of 50 to 75c. on screenings.

EASTERN coals fared no better than those from the Middle West. June brought about a rising market in smokeless prepared sizes, but buying was absent. Standard smokeless operators advanced prices on lump, egg, and stove 25 to 50c. for July, because of inability to move slack. Retailers, however, displayed little interest in the move. Slack went to the retail trade at \$1@\$1.10, but large tonnages were dumped to industrial accounts for 50c.

Prices of Eastern high-volatile block and egg remained at previous low levels, though a slight upward tendency was

Current Quotations—Spot Prices, Anthracite—Net Tons, F.O.B. Mines

		Week Ended							
		June 6, 1931		June 13, 1931		June 20, 1931		June 27, 1931	
	Market Quoted	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken	New York	....	\$6.90	....	\$6.90	....	\$6.90	....	\$6.90
Broken	Philadelphia	\$6.90@\$7.15	6.90	\$6.90@\$7.15	6.90	\$6.90@\$7.15	6.90	\$6.90@\$7.15	6.90
Egg	New York	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
Egg	Philadelphia	7.15@ 7.40	7.15	7.15@ 7.40	7.15	7.15@ 7.40	7.15	7.15@ 7.40	7.15
Egg	Chicago	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
Stove	New York	7.25@ 7.40	7.40	7.15@ 7.40	7.40	7.15@ 7.40	7.40	7.15@ 7.40	7.40
Stove	Philadelphia	7.40@ 7.65	7.40	7.40@ 7.65	7.40	7.40@ 7.65	7.40	7.40@ 7.65	7.40
Stove	Chicago	7.40	7.40	7.40	7.40	7.40	7.40	7.40	7.40
Chestnut	New York	7.15@ 7.40	7.40	7.00@ 7.40	7.40	7.00@ 7.40	7.40	7.00@ 7.40	7.40
Chestnut	Philadelphia	7.40@ 7.65	7.40	7.40@ 7.65	7.40	7.40@ 7.65	7.40	7.40@ 7.65	7.40
Chestnut	Chicago	7.40	7.40	7.40	7.40	7.40	7.40	7.40	7.40
Pea	New York	5.00@ 5.15	5.15	5.00@ 5.15	5.15	5.00@ 5.15	5.15	4.90@ 5.15	5.15
Pea	Philadelphia	5.15@ 5.40	5.15	5.15@ 5.40	5.15	5.15@ 5.40	5.15	5.15@ 5.40	5.15
Pea	Chicago	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15
Buckwheat	New York	3.00@ 3.25	3.25†	3.00@ 3.25	3.25†	3.10@ 3.25	3.25†	3.10@ 3.25	3.25†
Buckwheat	Philadelphia	3.25@ 3.50	3.25	3.25@ 3.50	3.25	3.25@ 3.50	3.25	3.25@ 3.50	3.25
Buckwheat	Chicago	3.25@ 3.75	3.25	3.25@ 3.75	3.25	3.25@ 3.75	3.25	3.25@ 3.75	3.25
Rice	New York	1.75@ 1.85	1.85	1.65@ 1.85	1.85	1.65@ 1.85	1.85	1.75@ 1.85	1.85
Rice	Philadelphia	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Rice	Chicago	1.85@ 2.35	1.85	1.85@ 2.35	1.85	1.85@ 2.35	1.85	1.85@ 2.35	1.85
Barley	New York	1.00@ 1.25	1.40	1.00@ 1.25	1.40	.90@ 1.25	1.40	.90@ 1.25	1.40
Barley	Philadelphia	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40

† Domestic buckwheat, \$3.70 (D. L. & W.).

noticeable at the end of the month. Eastern Kentucky and West Virginia operators used a price bait as low as $1 in some cases in fishing for sales. At the end of June, however, the range was $1.25@$1.50, with some sales at $1.75. High-volatile slack, like the low-volatile product, was slow in June. Prices ranged from 40c. for the poorest grades to 75c.@$1.25 for the best.

Both steam and domestic grades were slow in the St. Louis market in June. Coarse sizes were held fast in the grip of the usual summer slump, to which was added exceptionally hot weather, while the continued business depression deadened steam demand.

High temperatures banished thoughts of coal in the Southwest in June. A few steam contracts continued to absorb coal at the circular price of $1.50, but spot quotations hovered around $1.25. Kansas shovel lump went at $2@$2.25. Very little mine-run was sold as such, the bulk of the tonnage being crushed for screenings. Prices in general were 25c. lower than in May. Summer storage orders were meager.

June proved to be a slow month in the market at the Head of the Lakes. High temperatures put a damper on consumer ordering for storage, while orders for immediate use were small. Shipments from the docks in June are expected to come up to the totals of 11,483 cars in the preceding month and 12,380 cars in June, 1930. Receipts of coal, coke, and anthracite at the Duluth-Superior docks for the season to June 1 were 761,886 short tons, of which 689,800 tons was soft coal. Receipts in the same period in 1930 were 2,246,258 tons, of which 2,259,676 tons was bituminous coal. Prices were unchanged from those prevailing in April and May.

Low prices on domestic coal failed to stimulate buying in the Colorado market in June. Dealers, in the face of prevailing hot weather, refused to buy either for storage or current business, and business virtually came to a standstill. Production continued in its slump of several months' standing.

The Louisville trade was quiet in June. Prepared sizes and mine-run were slow, but curtailed production kept prices for screenings high in both eastern and western Kentucky. Mine-run was dull. Operating time in all sections of the state averaged two days a week.

Events in June dissipated the prevailing discouragement in the Cincinnati market. Lake business, which had lagged for two months, again perked up and orders flowed freely. The buying was welcome, even though purchasers were persistent in their attempts to get 10 or 20c. knocked off the price. Labor troubles in the East and South were an added stimulus, and helped to bring in inquiries from both the West and Northwest.

INABILITY to move slack caused smokeless operators to reduce running time at the mines, with the result that both spot and contract prices on domestic sizes advanced in June to the accompaniment of a fair demand. However, little interest was manifested in either screenings, small nut, or mine-run.

In the high-volatile market, the sharp price cutting of May came to an end in June, and a slight upward trend became apparent. Egg enjoyed considerable popularity, even in quarters where stove used to hold sway. Lump and block were hard to move, except for specialized lines, where price advances kept pace with those on smokeless coals.

Labor troubles in western Pennsylvania, eastern Ohio, and northern West Virginia worked to the advantage of the Columbus trade in June. Domestic sizes came in for a sharp increase in attention, and retailers bought liberally of both high- and low-volatile varieties. Smokeless coals were especially favored for storage purposes. Improvement in the steam trade, while slight, was still noticeable, though consumers showed no disposition to add to already depleted reserves. Lake business was good, and both Hocking and eastern Ohio producers shared in the fairly flourishing activity in contracting.

Labor troubles failed to have much effect on the Cleveland market in June. Coal was plentiful, and no difficulty was encountered in filling orders—largely for immediate needs. Prices showed no appreciable change, except for an increase of 10c. in slack quotations.

Consumers in the Pittsburgh market refused to increase contract takings or add to reserves in June, despite the growing belief that an early settlement of the western Pennsylvania strike was not probable. For that reason, price advances were confined almost exclu-

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

LOW-VOLATILE, EASTERN	Market Quoted	Week Ended June 6, 1931	June 13, 1931	June 20, 1931	June 27, 1931
Smokeless lump	Chicago	$2.25@$2.50	$2.25@$2.50	$2.50@$2.75	$2.50@$3.00
Smokeless egg	Chicago	2.25@ 2.75	2.25@ 2.75	2.50@ 2.75	2.50@ 3.00
Smokeless stove	Chicago	2.00@ 2.50	2.00@ 2.50	2.25@ 2.75	2.25@ 2.75
Smokeless nut	Chicago	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Smokeless pea	Chicago	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
Smokeless mine-run	Chicago	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Smokeless slack	Chicago	.60@ 1.10	.60@ 1.10	.60@ 1.10	.50@ 1.00
Smokeless lump	Cincinnati	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 3.00
Smokeless egg	Cincinnati	2.50@ 3.00	2.50@ 3.00	2.75@ 3.00	2.75@ 3.00
Smokeless stove	Cincinnati	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.50
Smokeless nut	Cincinnati	1.50	1.50	1.50	1.50
Smokeless mine-run	Cincinnati	1.60@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Smokeless slack	Cincinnati	.75@ 1.25	.75@ 1.25	.75@ 1.15	.75@ 1.25
*Smokeless mine-run	Boston	3.90@ 4.10	3.90@ 4.10	3.90@ 4.10	3.85@ 4.00
*Smokeless nut-and-slack	Boston	3.42@ 3.53	3.42@ 3.53	3.42@ 3.53	3.00@ 3.15
Clearfield mine-run	Boston	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
Clearfield mine-run	New York	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Cambria mine-run	Boston	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Somerset mine-run	Boston	1.45@ 1.90	1.45@ 1.90	1.50@ 1.90	1.50@ 1.90
Pool 1 (Navy Standard)	New York	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Pool 1 (Navy Standard)	Philadelphia	1.90@ 2.30	1.90@ 2.30	1.90@ 2.30	1.90@ 2.30
Pool 9 (super low-vol.)	New York	1.65@ 1.90	1.65@ 1.90	1.60@ 1.85	1.60@ 1.85
Pool 9 (super low-vol.)	Philadelphia	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85
Pool 10 (h. gr. low-vol.)	New York	1.50@ 1.65	1.50@ 1.65	1.50@ 1.60	1.50@ 1.60
Pool 10 (h. gr. low-vol.)	Philadelphia	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65
Pool 11 (low-vol.)	New York	1.40@ 1.50	1.40@ 1.50	1.35@ 1.45	1.35@ 1.45
Pool 11 (low-vol.)	Philadelphia	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)	New York	$0.90@$1.10	$1.00@$1.10	$1.00@$1.10	$1.00@$1.10
Pool 54-64 (gas and st.)	Philadelphia	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15
Pittsburgh sc'd gas	Pittsburgh	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80
Pittsburgh steam lump	Pittsburgh	1.60@ 1.80	1.60@ 1.80	1.60@ 1.80	1.60@ 1.80
Pittsburgh egg	Pittsburgh	1.65@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pittsburgh gas mine-run	Pittsburgh	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60
Pittsburgh steam mine-run	Pittsburgh	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60
Pittsburgh gas slack	Pittsburgh	1.00@ 1.20	1.00@ 1.20	1.00@ 1.20	1.00@ 1.25
Pittsburgh steam slack	Pittsburgh	.75@ 1.00	.75@ 1.00	.85@ 1.00	1.00@ 1.15
Connesville coking coal	Pittsburgh	1.35@ 1.75	1.35@ 1.75	1.25@ 1.65	1.25@ 1.65
Westmoreland lump	Philadelphia	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Westmoreland ¾-in. lump	Philadelphia	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85
Westmoreland egg	Philadelphia	1.15@ 1.65	1.15@ 1.65	1.15@ 1.65	1.15@ 1.65
Westmoreland mine-run	Philadelphia	1.55@ 1.70	1.55@ 1.70	1.55@ 1.70	1.55@ 1.70
Westmoreland slack	Philadelphia	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15
Fairmont lump	Fairmont	1.10@ 1.30	1.10@ 1.30	1.10@ 1.30	1.10@ 1.30
Fairmont ¾-in. lump	Fairmont	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15
Fairmont egg	Fairmont	.85@ 1.10	.85@ 1.10	.95@ 1.10	.95@ 1.10
Fairmont mine-run	Fairmont	1.00@ 1.20	1.00@ 1.20	1.00@ 1.20	1.00@ 1.20
Fairmont slack	Fairmont	.60@ .80	.60@ .80	.65@ .90	.65@ .90
Kanawha lump	Cincinnati	1.25@ 1.75	1.35@ 1.75	1.35@ 1.75	1.30@ 1.75
Kanawha egg	Cincinnati	1.15@ 1.50	1.10@ 1.50	1.10@ 1.50	1.15@ 1.50
Kanawha mine-run (gas)	Cincinnati	1.25@ 1.65	1.30@ 1.60	1.35@ 1.60	1.35@ 1.60
Kanawha mine-run (st.)	Cincinnati	1.00@ 1.25	1.00@ 1.25	1.00@ 1.30	1.00@ 1.30
Kanawha nut-and-slack	Cincinnati	.60@ 1.00	.60@ 1.00	.60@ .90	.60@ .90
Williamson (W. Va.) lump	Cincinnati	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Williamson (W. Va.) egg	Cincinnati	1.10@ 1.50	1.10@ 1.50	1.10@ 1.50	1.15@ 1.50
Williamson (W.Va.) mine-run (gas)	Cincinnati	1.35@ 1.60	1.35@ 1.60	1.35@ 1.60	1.35@ 1.60
Williamson (W.Va.) mine-run (st.)	Cincinnati	1.00@ 1.35	.90@ 1.25	1.00@ 1.25	1.10@ 1.35
Williamson (W.Va.) nut-and-slack	Cincinnati	.65@ 1.00	.65@ .90	.75@ .90	.75@ .90
Logan (W.Va.) lump	Cincinnati	1.15@ 1.60	1.15@ 1.60	1.20@ 1.60	1.20@ 1.60
Logan (W.Va.) egg	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.15@ 1.35
Logan (W.Va.) mine-run	Cincinnati	1.00@ 1.35	.90@ 1.35	.90@ 1.35	1.00@ 1.35
Logan (W.Va.) nut-and-slack	Cincinnati	.75@ .85	.75@ .85	.75@ .90	.75@ .90
Logan (W.Va.) slack	Cincinnati	.60@ .75	.50@ .75	.60@ .75	.60@ .75
Hocking (Ohio) lump	Columbus	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85
Hocking (Ohio) egg	Columbus	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65
Hocking (Ohio) mine-run	Columbus	......	......	......	......
Hocking (Ohio) nut-and-slack	Columbus	.75@ 1.00	.75@ 1.00	.75@ 1.00	.75@ 1.00
Pitts. No. 8 (Ohio) lump	Cleveland	1.50	1.50	1.50	1.50
Pitts. No. 8 (Ohio) ¾-in. lump	Cleveland	1.15@ 1.30	1.15@ 1.30	1.15@ 1.30	1.15@ 1.30
Pitts. No. 8 (Ohio) egg	Cleveland	1.20@ 1.35	1.20@ 1.35	1.20@ 1.35	1.20@ 1.35
Pitts. No. 8 (Ohio) mine-run	Cleveland	1.10@ 1.15	1.10@ 1.15	1.10@ 1.15	1.10@ 1.15
Pitts. No. 8 (Ohio) slack	Cleveland	.85@ .95	.85@ .95	.85@ .95	.85@ .95

*Gross tons, f.o.b. vessels, Hampton Roads.

sively to slack, though there was some stiffening in domestic quotations. Shipments to the Lakes increased, and a few Northwest consumers manifested some anxiety as to future supplies in case of a long drawn-out stoppage.

Strikes in northern West Virginia in June failed to reduce the available supply of coal or increase prices, except for a rise of 10c. in slack quotations at the end of the month. Demand was extremely sluggish, and most of the mines which operated ran on materially reduced schedules.

Central Pennsylvania producers experienced a slight but definite increase in demand in June, with the result that production showed week-to-week gains. Prepared sizes were especially popular. Prices, while unchanged, were firmer. Prevailing quotations at the end of the month were: Pool 1, $1.90@$2.30; Pool 71, $1.75@$2; Pool 9, $1.70@ $1.85; Pool 10, $1.50@$1.65; Pool 11, $1.40@ $1.50.

SENTIMENT in New England underwent a marked improvement in June, when several large steam users came into the market. Uncertainty as to the labor situation also added stimulus to the buying movement. At the end of the month, Navy Standard smokeless mine-run was quoted at $3.80 @$3.95, f.o.b. vessels at Hampton Roads, with choice grades commanding 15 to 20c. more. Surplus tonnage on the piers was a disturbing element, however, and the demand for prepared sizes resulted in considerable pressure to move nut-and-slack. The latter dropped to as low as $3@$3.15 at the end of June. Demand for all-rail coals from central Pennsylvania was extremely quiet.

Shippers to the New York market found most buyers indifferent to labor troubles. Certain railroads called for a little extra tonnage in June, as a precautionary measure, but other classes of consumers bought only for immediate use. Strikes caused high-volatile quotations to become firmer, but failed to affect low-volatile prices. Restriction of production, because of lack of demand for high-volatile lump, resulted in a strong price for slack. Mine-run, however, was in free supply.

The Philadelphia market found itself on rock bottom in June. Strikes failed to move consumers to the extent of ordering for the stockpiles they seemed determined to clean up, while the continued business depression and plenty of water caused a slump in railroad, industrial, and utility demand. Export business was slow, and bunkering activity was moderate.

Unusual quietness pervaded the Alabama market in June. High temperatures caused household buying to fall to still lower levels, with the result that the retail trade marked time over the whole of the month. Quotations fluctuated very little. Prices announced for July are as follows: Big Seam lump, egg, and nut, $1.90; Carbon Hill lump and egg, $2.05; nut, $1.90@$2; Corona lump and egg, $2.40; nut, $2.15; Cahaba lump and egg, $2.70@$3.85; nut, $2.80 @$2.95; Black Creek lump and egg, $3.20@$3.45; nut, $2.80; Montevallo-Aldrich lump, $4.35; egg, $4.10; nut, $2.80; Straven lump, $3.70; egg, $3.45; nut, $2.55; Dogwood lump, $4.35; egg, $4.10. Steam business was at a low ebb in June, and screenings, in spite of curtailed production, were hard to move. Ruling prices on steam coal were: Black Creek, minus 1¼-in. $1.75@$2; Cahaba, minus 3-in., $1.65@$1.85; minus 1-in., $1.10@$1.25; Big Seam mine-run, $1.60@$1.75; washed, $1.25 @$1.50.

Summer dullness closed down on the New York anthracite market in June. Householders willing to purchase next winter's supply of coal on the regular credit of 30 days were scarce, with the result that the retail trade was forced to take it easy. Resentment on the part of apartment house owners because of advances in the price of pea and buckwheat also deterred buying. This attitude, which almost amounted to a strike, was reflected in surpluses of pea and buckwheat at the mines, and independents offered tonnage at 10 to 25c. off company prices. Rice also eased slightly and the weakness in barley continued. Egg met with a consistently good demand, while stove moved moderately well. Chestnut, however, was a drug on the market, and became so troublesome as to cause some curtailment in mining.

Conditions in the Philadelphia market in June practically duplicated those prevailing in New York, except that chestnut was moved fairly well, while egg was quiet. The advanced prices in pea and buckwheat depressed buying of these sizes in Philadelphia as well as in New York, with the result that some surplus tonnage piled up at the mines. Rice moved fairly well, but barley, as in New York, was weak.

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

	Market Quoted	Week Ended June 6, 1931	June 13, 1931	June 20, 1931	June 27, 1931
MIDDLE WEST					
Franklin (Ill.) lump	Chicago	$2.40	$2.40	$2.40	$2.40
Franklin (Ill.) egg	Chicago	2.35@ 2.50	2.35@ 2.50	2.35@ 2.50	2.35@ 2.50
Franklin (Ill.) mine-run	Chicago	2.15	2.15	2.15	2.15
Franklin (Ill.) screenings	Chicago	1.50@ 1.75	1.50@ 1.75	1.25@ 1.75	1.25@ 1.75
Central Ill. lump	Chicago	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Central Ill. egg	Chicago	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Central Ill. mine-run	Chicago	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80
Central Ill. screenings	Chicago	.75@ 1.25	.75@ 1.25	.65@ 1.00	.60@ 1.00
Ind. 4th Vein lump	Chicago	2.10@ 2.50	2.10@ 2.50	2.00@ 2.50	2.00@ 2.50
Ind. 4th Vein egg	Chicago	2.00@ 2.50	2.00@ 2.50	2.10@ 2.50	2.10@ 2.50
Ind. 4th Vein mine-run	Chicago	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Ind. 4th Vein screenings	Chicago	1.25@ 1.50	1.25@ 1.50	1.10@ 1.50	1.00@ 1.40
Ind. 5th Vein lump	Chicago	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10
Ind. 5th Vein egg	Chicago	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Ind. 5th Vein mine-run	Chicago	1.20@ 1.75	1.20@ 1.75	1.20@ 1.75	1.20@ 1.75
Ind. 5th Vein screenings	Chicago	.70@ 1.25	.70@ 1.25	.60@ 1.10	.55@ .90
Mt. Olive (Ill.) lump	St. Louis	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Mt. Olive (Ill.) egg	St. Louis	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Mt. Olive (Ill.) mine-run	St. Louis	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50
Mt. Olive (Ill.) screenings	St. Louis	.90@ 1.25	.90@ 1.25	.90@ 1.25	.90@ 1.25
Standard (Ill.) lump	St. Louis	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Standard (Ill.) egg	St. Louis	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60
Standard (Ill.) mine-run	St. Louis	1.25@ 1.40	1.25@ 1.40	1.25@ 1.40	1.25@ 1.40
Standard (Ill.) screenings	St. Louis	.85@ 1.10	.85@ 1.10	.85@ 1.10	.85@ 1.10
West Ky. lump	Louisville	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40
West Ky. egg	Louisville	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40
West Ky. nut	Louisville	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40
West Ky. mine-run	Louisville	.85@ 1.25	.85@ 1.25	.85@ 1.25	.85@ 1.25
West Ky. screenings	Louisville	.70@ .80	.60@ .85	.65@ .85	.60@ .75
West Ky. lump	Chicago	1.00@ 1.40	1.00@ 1.40	1.00@ 1.40	1.00@ 1.40
West Ky. egg	Chicago	1.00@ 1.40	1.00@ 1.40	1.00@ 1.40	1.00@ 1.40
West Ky. screenings	Chicago	.65@ .85	.65@ .85	.65@ .85	.60@ .75
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$1.80	$1.80	$1.80	$1.80
Big Seam mine-run	Birmingham	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Harlan (Ky.) block	Chicago	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Harlan (Ky.) egg	Chicago	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65
Harlan (Ky.) slack	Chicago	1.10@ 1.20	1.10@ 1.20	1.10@ 1.20	.75@ .90
Harlan (Ky.) block	Louisville	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 2.00
Harlan (Ky.) egg	Louisville	1.40@ 1.70	1.40@ 1.70	1.40@ 1.70	1.40@ 1.70
Harlan (Ky.) mine-run	Louisville	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
Harlan (Ky.) nut-and-slack	Louisville	.90@ 1.10	.90@ 1.10	.75@ 1.00	.70@ 1.00
Harlan (Ky.) block	Cincinnati	1.40@ 2.25	1.40@ 2.25	1.35@ 2.25	1.25@ 2.25
Harlan (Ky.) egg	Cincinnati	1.10@ 1.75	1.10@ 1.75	1.10@ 1.75	1.10@ 1.75
Harlan (Ky.) mine-run	Cincinnati	1.25@ 1.50	1.25@ 1.50	1.25@ 1.60	1.15@ 1.65
Harlan (Ky.) nut-and-slack	Cincinnati	.85@ 1.00	.80@ .90	.80@ .90	.85@ .95
Hazard (Ky.) block	Chicago	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50
Hazard (Ky.) egg	Chicago	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50
Hazard (Ky.) slack	Chicago	1.00@ 1.20	1.00@ 1.20	1.00@ 1.20	.65@ .85
Hazard (Ky.) block	Louisville	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75	1.25@ 1.65
Hazard (Ky.) egg	Louisville	1.25@ 1.40	1.25@ 1.40	1.25@ 1.40	1.25@ 1.40
Hazard (Ky.) mine-run	Louisville	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40	1.15@ 1.25
Hazard (Ky.) nut-and-slack	Louisville	.65@ .90	.50@ .75	.60@ .75	.60@ .75
Hazard (Ky.) block	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35
Hazard (Ky.) egg	Cincinnati	1.00@ 1.35	1.10@ 1.35	1.10@ 1.40	1.10@ 1.40
Hazard (Ky.) mine-run	Cincinnati	1.00@ 1.35	.90@ 1.35	1.00@ 1.35	1.10@ 1.35
Hazard (Ky.) nut-and-slack	Cincinnati	.75@ 1.00	.75@ .90	.75@ .90	.75@ .90
Elkhorn (Ky.) block	Chicago	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Elkhorn (Ky.) egg	Chicago	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Elkhorn (Ky.) slack	Chicago	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	.90@ 1.25
Elkhorn (Ky.) block	Louisville	1.25@ 2.00	1.25@ 2.00	1.25@ 2.00	1.25@ 2.00
Elkhorn (Ky.) egg	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) mine-run	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) nut-and-slack	Louisville	.90@ 1.10	.90@ 1.10	.75@ 1.00	.75@ 1.00
Elkhorn (Ky.) block	Cincinnati	1.30@ 2.75	1.30@ 2.75	1.30@ 2.75	1.30@ 2.75
Elkhorn (Ky.) egg	Cincinnati	1.10@ 1.75	1.10@ 1.75	1.10@ 1.75	1.20@ 1.75
Elkhorn (Ky.) mine-run	Cincinnati	1.00@ 1.60	1.00@ 1.60	1.00@ 1.60	1.00@ 1.60
Elkhorn (Ky.) nut-and-slack	Cincinnati	.85@ 1.00	.80@ .90	.75@ .90	.75@ .90
Kansas shaft lump	Kansas City	3.00@ 3.25	3.00@ 3.25	3.00@ 3.25	3.00@ 3.25
Kansas strip lump	Kansas City	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Kansas mine-run	Kansas City	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Kansas screenings	Kansas City	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50

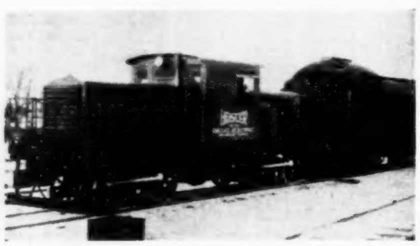
WHAT'S NEW

IN COAL-MINING EQUIPMENT

Oil-Electric Locomotive Claims Include Greater Power

A new, 60-ton, 360-hp., oil-electric locomotive for switching, hauling in strip mines, or other industrial uses has been developed by the Heisler Locomotive Works, Erie, Pa. According to the company, tests made with the new locomotive by means of a dynamometer car showed that the drawbar pull was 47,800 lb. on a level track, equal to that of a 100-ton steam locomotive. Tests on a 3 per cent grade on a 14-deg. curve showed 83 per cent more haulage capacity than an 80-ton steam locomotive. On the basis of tons of locomotive weight, the oil-electric machine hauled 143 per cent more than the 80-ton steam equipment.

Power is supplied by two 180-hp. Buda diesel engines through two West-

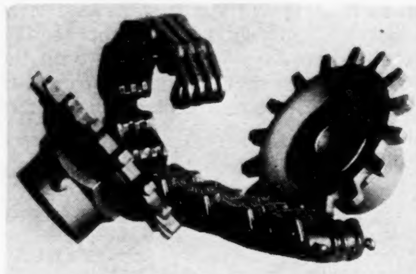


Heisler, 60-Ton, Oil-Electric Locomotive Coupled to Dynamometer Car

inghouse direct-current generators. Universal joints in the drive shaft permit the trucks to swivel freely and allow operation on very sharp curves. For light work, the company says, the locomotive can be operated on only one engine and generator. Cost of fuel oil for one day's operation of the 60-ton locomotive is only \$2.50 to \$3.50, against \$20 to \$30 for coal for a steam switching locomotive, the makers declare. Other sizes of this type of oil-electric locomotive with both gasoline and diesel engines will be available in the future for operation on tracks of 36 to 56½ in.

Flexible Coupling Is Small

In installations where the horsepower is small, the problem of shaft flexibility is becoming just as important as on jobs up to 5,000 hp., says the Morse Chain Co., Ithaca, N. Y., division of the Borg-Warner Corporation. For this reason, the company offers the "Midget" flexible coupling, which it states is a miniature counterpart of the Morse chain-and-sprocket coupling used



Morse "Midget" Flexible Coupling

on installations up to 5,000 hp. Essential parts are two sprockets wrapped by a chain, making the coupling exceedingly simple, the manufacturer asserts. The "Midget" coupling is designed for shaft sizes up to 1 in. in diameter. Few parts result in high efficiency, it is said, while all-steel construction will give long, trouble-free life.

Picking Table Carries Refuse On Lower Strand

Efficiency and economy are claimed for the new "Pittsburg" picking table of the Pittsburg Boiler & Machine Co., Pittsburg, Kan. A flat apron conveyor is used to carry the coal past the pickers. Refuse chutes, instead of being set in the floor, are flush with the top of the table. "Backstops" on these chutes, the company says, make it unnecessary for the picker to remove his eye from the table to hit the chute. The picker, it is said, can remove refuse with both hands and throw right and left. Picking, therefore, is faster, more perfect, and requires less labor.

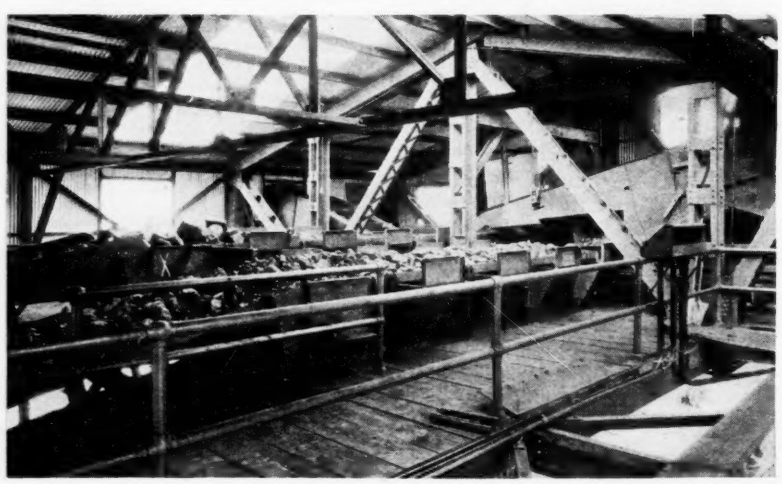
The refuse chutes deliver to the lower strand of the picking table, which transports the refuse back to the end of the table, where a fixed plow scrapes it off onto the refuse conveyor. Location of the picking table chains is near the center of the aprons instead of on the outer ends. This form of construction, the company says, allows the pickers to stand a full 6 in. closer to the coal and enables them to easily pick from a 5-ft. table. In addition, this construction permits delivery of the refuse to the lower strand. Use of the wider table, it is stated, permits spreading the coal more thinly, making picking faster and easier.

Pump for Abrasive Liquids

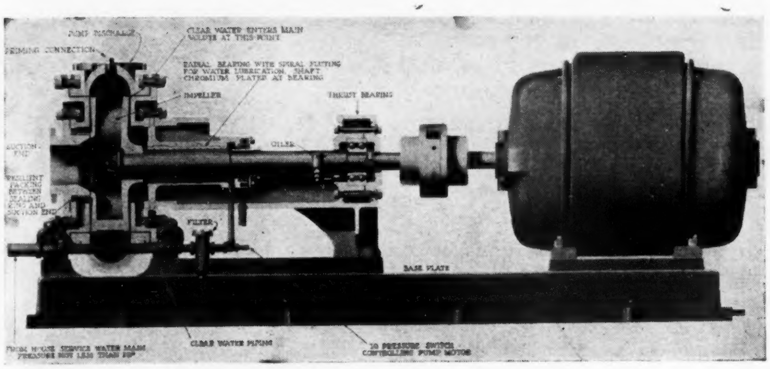
The "Hydroseal" pump has been developed for handling abrasive liquids by the Allen-Sherman-Hoff Co., Philadelphia, Pa., which says that the equipment is designed to eliminate high maintenance, low average efficiency, and discharge pressure limitations inherent in ordinary pumps for use with ash-laden water. In the pumping of material, the company says, operation of the unit is identical with that of the ordinary centrifugal pump. Added features have been incorporated in the design, however, to adapt it for the service it is expected to perform.

Construction is such, it is stated, that clear water at low pressure is introduced into the casing at the sides of the impeller. Due to the adhesion of the water to the side surfaces of the im-

"Pittsburg" Picking Table. Refuse is Chuted to the Lower Strand of the Table, Which Carries It Back to the Refuse Conveyor in the Rear



What's NEW *in Coal-Mining Equipment*



"Hydroseal" Pump, Showing Construction

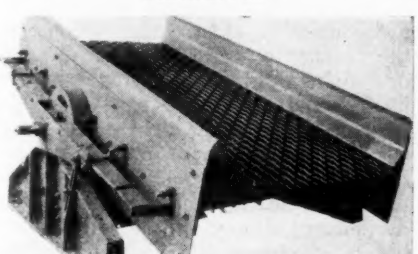
peller, and the close fit between impeller and side walls, the pressure of the clear water is boosted above that in the pump volute, with the result that the annular clearances are constantly filled with fresh water. Consequently, the abrasive liquid being pumped cannot wear the impeller shrouds or the side plates of the casing. The pump is so arranged that leakage through the sealing ring also consists of clear water, with the result, it is declared, that the efficiency of the sealing ring is maintained and the pump retains its efficiency and discharge head indefinitely. In addition, the clear water need not be at higher than the pump pressure, as is the case with "gland" water introduced in the conventional pump, and abrasive water cannot leak out along the shaft.

Impeller overhang also has been greatly decreased in the "Hydroseal" pump, the company says, so that there is no impeller whip and the impeller speed can be greatly increased. Consequently, the company says, pressures as high as 150 lb. per sq.in. can be obtained with high efficiencies. The quantity of clear water is minimized and controlled for operation where this water is scarce or costly. The clear water also controls the operation of the pump, as it is impossible to start the pump unless clear water is available.

Transverse Springs Feature Vibrating Screen

Two new features have been incorporated in the "Gyrex" vibrating screen manufactured by the Robins Conveying Belt Co., New York City. Horizontal leaf springs are used, which run lengthwise of the screen frame. Instead of resting in the usual shackle, these springs are rigidly fastened to transverse leaf springs which are set on edge and bolted to the live frame. According to the company, the transverse springs serve to center the screen frame on the shaft and thus eliminate side-thrust on the eccentric bearings. Also, the arrangement does away with shackles and their attendant maintenance expense. The second change made by the company is in the vibrating unit. The counterweight is in the form of an overhanging arm and is in the same plane as the eccentric bearing. Advantages claimed are: bending stresses due to centrifugal force are eliminated, and the counterweight permits of close compensation for the unbalanced load of the live frame.

"Gyrex" Screen, Showing Spring Construction

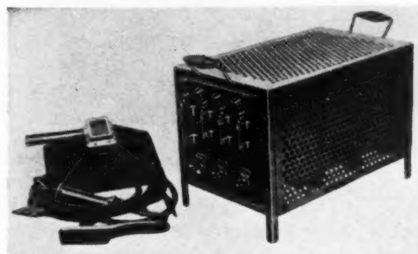


Trolley Clamp Accommodates Heavy-Section Wire

To accommodate 6-0 trolley wire, the Ohio Brass Co., Mansfield, Ohio, has designed the new Bulldog trolley clamp with larger and heavier parts. At the same time, the company says, special care has been taken to retain features in past designs. Greater opening of the jaws to accommodate the larger wire has been provided, in addition to greater gripping power and strength. Jaws are heavier and the gripping nut and hinge are more substantial, the company declares. No force which can be exerted by the ordinary trolley wrench can damage the equipment, it is asserted. In addition, the gripping power of the clamp may be adjusted at the mine to allow to release the trolley wire under excessive stress. Jaws open and close through the positive action of the head nut, which operates in a vertical direction. Other advantages detailed by the company are: good wheel clearance and certainty of reclamation. Length of the jaws is 3 in., and the entire clamp is made of "Flecto" malleable iron, hot-dip galvanized.

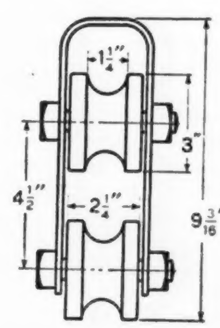
Bulldog Trolley Clamp

Frequent cases are encountered in mining practice where the normal 250-volt trolley current is as high as 300 volts near the substations and power houses, declares the Ohio Brass Co. It is not uncommon that bonding takes place within such zones of high power, and it frequently happens that repair shops where welding is done are fed by this higher voltage. To meet the needs of mine welding crews, Ohio Brass has developed a 300-volt resistance welding machine to augment the regular 250-volt model. All of the features of the previous welding machines have been retained in the 300-volt model, which is designed to deliver service under the hard conditions met in mining practice.



Ohio Brass Resistance Welding Machine

Due to demands brought about by greater developments in mine electrification, the O-B, Type C, feeder insulator has been made available in the 2-spool design for the accommodation of 500,000 c.m. cable, says the Ohio Brass Co. Similar to other models, the new insulator is suspended from the mine roof by a single expansion bolt. The steel yoke is of ample strength and the spools are of dense porcelain. These factors are combined to produce a device that will meet the demands placed upon such equipment over long periods of hard service, the company declares.



Construction Details, Ohio Brass Two-Spool Feeder Insulator

Hard-Boiled Hats Are Flexible

Greater flexibility has been obtained on the new Bullard hard-boiled hats and caps, the E. D. Bullard Co., San Francisco, Calif., asserts. This increased flexibility, it is declared, makes the hat more comfortable to wear, as it may be shaped to fit the wearer's head better.

Showing Flexibility of the Bullard Hat

Also, it is said, the flexibility makes the hat a better protector from falling rocks, as the force of the blow is absorbed by the hat. Another feature pointed out by the company is the "hammocking" construction, consisting of four broad strips of heavy fabric. The "hammock," it is asserted, increases the strength of the hat and improves the ventilation, thus making it more comfortable to wear.

Wrought-Iron Welding Elbows

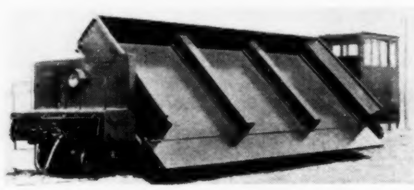
Locomotive Terminal Improvement Co., Chicago, and A. M. Byers Co., Pittsburgh, Pa., have jointly developed new wrought-iron welding elbows. These elbows, known as "Weldells," range in size from 2 to 12 in., and are manufactured with the same radius and center-to-face measurements as standard radius fittings. In the forging, a tangent is formed on each end, making them interchangeable with standard fittings, and the ends are beveled 45 deg. for welding. Stock sizes include both standard and light-weight (10-gage) sections. "Weldells," it is said, are forged from wrought-iron plate with a smooth, uniform internal diameter and a reinforcing rib along both the outer and inner curvature of radius. The process permits the elbows to be made from the same material as the balance of the piping system.

"Weldells"

Gas-Electric Dump Car

Differential Steel Car Co., Findlay, Ohio, has developed a new gas-electric dump car, consisting essentially of a locomotive chassis with a side-dump body mounted on it. The car is self-contained and is designed, the company says, for open-pit or quarry work where steam equipment is uneconomical because of high maintenance or operating costs, or where electric power is not available except at high cost. Capacity of the dump body is 24 cu.yd. Weight of the equipment is 45 tons light and 80 tons loaded. Distance from center to center of trucks is 29 ft.

The power plant consists of two Buda gasoline engines rated at 155 hp. at 1,200 r.p.m., two Westinghouse generators, four Westinghouse motors, and the necessary control equipment. Maximum tractive effort of the double power plant is 36,000 lb., and the free-running speed without load is 19 m.p.h. One or both power plants may be used, as desired, it is stated, giving flexibility in operation and reducing cost of operation with light loading.

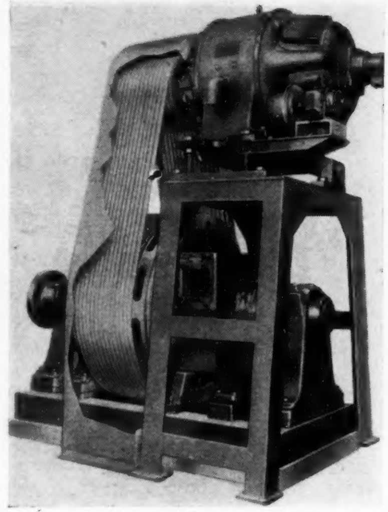


Gas-Electric Dump Car

Speed Control System Developed For A.C. Motors

For use with machinery requiring a variable-speed drive, the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has developed the Rossman drive unit. Essentially, the equipment consists of a drive unit and a regulating unit. The drive comprises a constant-speed, induction or synchronous, a.c. motor and an adjustable speed, d.c. motor. In the a.c. motor, both the rotor and stator are free to rotate about a common axis. The rotor is connected to the load, while the stator is connected to the d.c. motor, either directly or through a "Texrope" drive. Speed variation is accomplished by a regulating unit, which is a standard motor-generator set. The armatures of the d.c. machines are electrically connected.

When its stator is at rest, the a.c. driving motor operates as a standard motor at rated speed. To increase or decrease the speed of the load, the d.c. driving motor is started up in one direction or the other, its speed and direction of rotation being regulated by the voltage impressed on its terminals by the motor-generator set. With the d.c. driving machine running, the stator of the a.c. driving machine is rotated in one or the other direction. As the speed relation between the stator and rotor is constant, increasing or decreasing the speed of the stator increases or decreases the speed of the rotor and, consequently, the load. The Rossman system can be used for either constant- or variable-torque drives, and the company says that its efficiency is such that material savings can be made by its use.



Rossman, Variable-Speed Drive Unit, 430 Hp., 1,088 to 444 R.P.M.; A.C. Driving Motor Is at the Bottom

New Pyrometer Controller Is Indicating

The Brown Instrument Co., Philadelphia, Pa., now offers the Model 801 indicating pyrometer controller, which it asserts can be used as an automatic control, pyrometer, resistance thermometer, tachometer, or CO_2 meter. It embodies mercury contacts for interrupting high electrical currents. Advantages listed by the company are:

Direct reading on a 6-in. scale; index on scale for setting to exact control point; inclosed wiring terminals and motor to eliminate danger when used in the presence of explosive or inflammable gas; mercury switches with a capacity up to 30 amp., obviating the use of relay equipment; adaptable to "on and off" or "three position" control through switches, valves, and dampers; available with safety device which opens the furnace circuit if the thermocouple or wiring fails, thus preventing the burning-out of furnaces; possesses high internal resistance, which makes for accuracy; equipped with internal compensation to eliminate cold-junction errors when the instrument is applied as a pyrometer; simply and sturdily built to insure maximum life with a minimum of attention.